Re-printed from "The Surrey Herald" of the 7th August, 1925

"THE CHERTSEY CARLYLE"

How our Earth was Created

It is like picking up a story by Jules Verne (and reading what in its author's day were delightful flights of scientific fancy, but which have now come to be undisputed reality) to read a book which has just been published under the title of "Electrical Condition"

This book was written in the years between 1871 and 1890 by Mr Franklin Coxworthy, who lived at Chertsey, in London-street, and who died there, leaving the work in manuscript form

Miss Julia Coxworthy, the author's daughter, has now illustrated and edited the book, which is on sale at 3s 6d

Let it not be thought from the opening comparison that this book is a romance. It is a scientific work It sets out the author's theories with regard to many things that were problems in his day, but which have now been proved to coincide with his line of thought One of the theories, however, that has not yet come to pass is that the earth will ultimately fall into the sun

Miss Coxworthy writes "There will still be many of the older inhabitants of Chertsey who will remember the author as 'The Carlyle of Chertsey,' the name bestowed upon him owing to his resemblance to that gentleman—Thomas Carlyle"

"In Creation there is but one agent—Electricity, the cause of life, disease, cold, heat, light, gravitation, cohesion, weight, and crystallisation," the book says

The book, which has the sub-title of "How and Where our Earth was Created," is published by J S Phillips, Shoe-lane, E C 4 Copies are obtainable from ~~Miss Taylor, Windsor Street, Chertsey~~ him

also from Messrs Truslove and Hanson 153 Oxford St London W. from the 658a Strand and from Mr Thin University Publisher Edinburgh

Remarks on Prof Wegener's claim to be the originator of two of Franklin Coxworthy's discoveries

SINCE the publication of this edition of ' Electrical Condition," in November 1924, I have had my attention drawn to an article in Discovery" of May 1922 by Professor Wegener, in which he claims as his the discovery that in Mesozoic times Earth's land was in one mass, as illustrated in his chart of the Carboniferous Period, which shows a great similarity to my father's chart on p 71 of this book

The second discovery which the Professor claims to have originated is that this mass of land underwent displacement

But both these discoveries were originated by Franklin Coxworthy and published by him in his first edition of "Electrical Condition" in 1848, and in "The Mining Journal" in 1851, 1855, and in 1868 in three long series of articles, in which he explained his ideas of the creation of the world, they form two of the main points of interest of this ,edition of "Electrical Condition," and will be found fully explained in Chapter VII and subsequently

Professor Wegener published his version of these two theories in Germany in 1912—that is to say, forty-four years later than Franklin Coxworthy's publication of 1868 in "The Mining Journal"

It is therefore evident that the credit of originating these two interesting theories belongs to Franklin Coxworthy, as he antedated the Professor by so many years in presenting them to public notice

JULIA COXWORTHY

~~9 The College, Northfleet~~ 16 Wedgall Road
25th May 1925 Lee London SE.12.

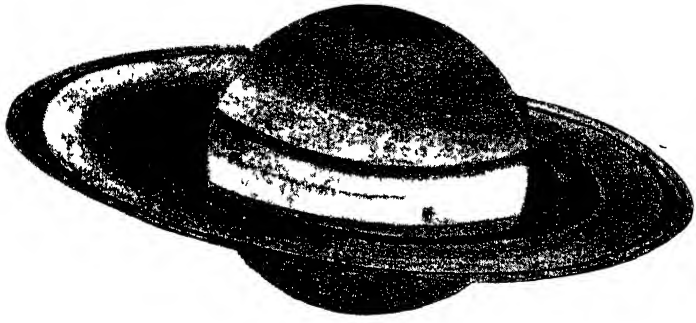
It is very gratifying to know that the observations made during the recent close opposition of Mars to us have definitely proved that Franklin Coxworthy was right when he asserted, seventy years ago, that Mars possessed an atmosphere like our own and was inhabited by human beings, and this in spite of the statement then made by scientific men that Mars was utterly frozen out and not habitable

It is now ascertained that he possesses vegetation, seas land, trade and other winds, rain, &c His mass of land might very well represent what Earth looked like to the inhabitants of Venus, when our land was in one mass, until the Tertiary era

ELECTRICAL CONDITION;

or

HOW AND WHERE OUR EARTH WAS CREATED.



THE PLANET SATURN

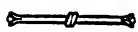
ELECTRICAL CONDITION;

OR

HOW AND WHERE OUR EARTH WAS CREATED.

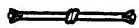
BY

FRANKLIN COXWORTHY



EDITED AND ILLUSTRATED BY HIS DAUGHTER

JULIA COXWORTHY, L L.A.



London
J S PHILLIPS,
99 SHOE LANE, FLEET STREET, E C.4

In Creation there is but one agent—Electricity, the cause of life, disease, cold, heat, light, gravitation, cohesion, weight, and crystallisation

PREFACE.

My father, the late Mr Franklin Coxworthy, published a small edition of a work entitled "Electrical Condition in 1848," giving his ideas of the creation of the Earth by means of electricity, as God's sole agent in that creation But electricity was so little known or thought of at that date that his book attracted very little attention, although several commendatory notices of it appeared in "The Mining Journal," "The Chemist," &c Up to his death, in 1890 he was engaged in writing this larger edition which is now offered to public notice As he died so many years ago, I have thought it necessary to insert in this later edition many facts which were unknown at the time of the earlier publication, but without which the book would now be considered incomplete

One of these facts is the closing of the Panama Canal When this canal was first thought of by M de Lesseps, my father wrote to him warning him that a canal through the Isthmus would be almost impossible, as the parts of North and South America which are now contiguous there did not occupy that position originally, but were brought into juxtaposition at the break-up of Earth's land (see Chapter XI) Consequently, it would be found that there was a break between the Rocky and Andes Ranges, and instead of solid rock there would only be sand and clay, &c, to cut into

This idea of his has been proved to be correct, the frequent landslides having caused the canal to be closed many times

And now (1924) the discovery has been made that atoms are composed of a positive electric nucleus around which revolve negative electrons, like planets revolving around their central Sun As all matter consists of atoms, this discovery decisively proves that my father was right when he asserted that electricity is the mainspring of the Universe His papers

in "The Chemist," from April to October 1847, in "The "Chemical Times," 1849, and in 'The Mining Journal," all through 1851 and in 1855-7, dealt with the evolution of our Earth by means of electricity, and these papers are incorporated in this book

I wish to express my indebtedness to Mr Mark Wicks, author of "To Mars *viâ* the Moon," for his kindness in reading and criticising the original text of the following chapters While refraining from any undue interference with my father's expression of his original ideas, he was able to make suggestions and comments from a more recent astronomical and scientific point of view, which have proved very helpful to me in the editing of this book

I think it best to present a short summary of the plan of the book, which shows how and where our Earth was created, and how she has reached her present state and what her future will be

Scientific men are all agreed that our Earth was once molten, as indicated by the igneous rocks of the Azoic period and the internal heat still possessed by our planet, which is evidenced by volcanic eruptions, hot water springs, and the high temperature of coal mines at the present time

Astronomers are now agreed that the planets in the distant orbits of our Solar System are at present in this hot state—*i e*, Neptune, Uranus, Saturn, and Jupiter

When my father first gave it as his opinion seventy-seven years ago that Neptune and Uranus were in a state of molten heat and in the earliest stages of planetary evolution he was scoffed at, but both these ideas of his are now proved to be correct

In an address given by the late Professor P. Lowell before the Royal Astronomical Society of Canada, April 27, 1916, we are led to infer that he considers Uranus is in a state of molten heat and in the blind puppy stage of evolution—in his babyhood, in fact—as proved by Dr V M Slipher's experiments in spectrum analysis (see "English Mechanic," September 1, 1916)

It being evident that had our Earth always revolved in her present electrical orbit she could never have been in the

state of molten heat, which her primary rocks undoubtedly show was her condition when they were formed, and the distant orbits possessing the tremendous heat which was necessary to fuse our igneous rocks, my father came to the conclusion that our Earth began life as a comet, travelling to and from the Sun, collecting as gases the materials such as silica, oxygen, alumina, &c, necessary to form the primary and secondary rocks After many thousands or millions of years spent as a comet, and having acquired sufficient of the elements required to form a planet, Earth began to revolve in the furthest orbit of the Solar System in a gaseous form such as Neptune's to-day, the outermost planet at present discovered in our Solar System

At the same time, Venus and Mercury, Earth's predecessors, must have been revolving in the orbits now occupied by Uranus and Saturn When Earth left the outermost orbit and passed into that now occupied by Uranus, she then, as now, followed the path set by her predecessors, all of whom at the same period also advanced spirally into the next orbit towards the Sun, Earth in due time being followed by Mars, Jupiter, and Saturn, &c, in the same order as to-day My father concluded that all the planets of a Solar System pass through the same orbits and the same phases in their evolution

In the orbits of Neptune and Uranus Earth acquired the Azoic igneous rocks and Primaries such as granite, gneiss, porphyry, malachite, &c

In Saturn's orbit the Secondaries (sandstones, carbonates, and coal measures with elementary forms of life) were acquired, in Jupiter's orbit, rock-salt, atmosphere and oceans, huge reptiles, fish, and Saurians, &c

Leaving the orbit of Jupiter, Earth entered that of the Asteroids or Planetoids, now a numerous body of small planets, between the orbits of Jupiter and Mars Until 1800 none of these was known, Ceres being discovered in 1801 Up to 1876 only 167 had been mapped out by astronomers, but in 1915 they numbered 800

If these 800 Asteroids had been in existence in the 19th century, it is possible they would have been discovered earlier than they were, although modern astronomers claim that im-

proved telescopes and photography enable them to perceive the smaller planetoids which escaped the notice of their predecessors

But if there was a large number of Asteroids which escaped notice in the 19th century, or whether they have increased in number since then, matters not, in any case they are ready in their orbit to fulfil the purpose for which my father assumed God created them—*i e*, to form the outer crust or Tertiaries of Jupiter, which will be the next planet to enter their fixed orbit

If this theory of the evolution of planets be correct, when Earth reached the Asteroids, there was a number of these bodies ready for her, and Earth, as she yearly revolved in their orbit, annexed them to herself, thus receiving the warm-blooded animals (including mankind) and the Tertiaries, which buried where they fell the Primaries and Secondaries

It is quite within the bounds of possibility that the inhabitants of Venus saw Mars gathering up the Asteroids as he travelled around in their orbit, and that future generations on Earth may witness Jupiter annexing these little bodies when, in its turn, that planet shall enter that orbit

When Earth left the Asteroid orbit, where through cooling, &c, she underwent much contraction in bulk, she entered that now occupied by Mars, where occurred the glacial and volcanic eras, the formation of our Moon, the expansion of Earth to her present dimensions, and her last change of angle of inclination, by which processes the land was broken up into continents and the mountains were formed

This is not an imaginary theory, but all the stages of our Earth's evolution, the formation of her rocks, minerals, air, oceans, flora and fauna are all borne out by facts culled from the Earth herself, or what may be called the book of Nature, and which facts are supported by quotations from past and present scientific writers

Sir John Herschel, writing in 1866, stated that the planets of our Solar System do not revolve yearly around the Sun in the same orbit over and over again, always keeping at the same distance from him, but that they all revolve spirally towards the Sun, into which eventually they will all fall, each

one in its due time when its course and its mission are finished according to my father this spiral approach to the Sun taking place at certain periods in their evolution, which might occur at very long intervals of time of some thousands or even millions of years apart

All Nature is constantly moving onwards, and as with man, so with worlds A man is born, grows up, decays, dies, and is succeeded by the next generation So with our Earth She was formed by the Almighty in the further orbits of the Solar System We can trace her history up to the present time, we can read it clearly in the book of Nature, and in the same way that a human being knows that one day death will claim his body, so, looking at the present state of Venus and Mercury, we can see what will be the fate of Earth when she enters the orbit of Venus change of angle from $23\frac{1}{2}^{\circ}$ to 15° —a gradual slowing down of our daily rotation, till, like Mercury, as now some astronomers assert, Earth will always present to the Sun the same hemisphere, which will be scorched by a heat twice as great as that which is now felt in our Tropics, while the other hemisphere, ever turned from the Sun, will be plunged in darkness, covered with ice, with a degree of cold beyond conception There will be no life on Earth then, the air will decrease, the oceans will evaporate, causing a thick mist such as for some years has enveloped Venus

In the orbit of Mercury Earth will become like that planet is now—a burnt-out, dead world, no air, no water, great hollows, where once the sea flowed, showing fragments of our wrecked Titanics, on the land, remains of ruined cities, and, finally, she will fall into the Sun, whether or not to emerge again as a comet we cannot tell!

JULIA COXWORTHY

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~~August 1924~~ Lee London SE 12

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ELECTRICAL CONDITION

OF

THE SOLAR SYSTEM AND GEOLOGY.

EARTH AS A COMET.

CHAPTER I

Beginning of Earth as a comet—The Solar System—Mercury, Venus, Earth, Mars, The Asteroids, Jupiter, Saturn, Uranus, Neptune, Comets, Encke's Comet—Primary rocks formed when Earth was in the orbits of Neptune and Uranus—Comets may become planets—Primary rocks formed in the orbits the furthest removed from the Sun

CONSTITUTED as man is, on such a gigantic question as the above, he can, at the best, but grope his way His attention being directed to the fact that in the superposition of rocks there is an apparent order, he climbs the mountains, descends into the bowels of the earth, and dredges the ocean, in the hope of there obtaining evidence of the law under which our world was compounded, and by the facts obtained is bewildered in proportion to their multiplicity

He is told that the lower rocks were laid down as mud at the bottom of the ocean, which mud was then hardened by heat and pressure, and that this again was reduced to a pulp by the agency of waves to the compounding of some other formation Thus lowering the Creator to a level with himself

Reviewing the facts of science placed at our disposal by former generations, we sought—of course in vain—for the law that governs the formation and decomposition of matter, but following a glimmer of electrical light that presented itself, after many turnings and stumblings in our geological enquiry, the fact of the earth having been compounded as mud, and the principle that centrifugal (rotation in a planet) tends to

throw all matter towards the equator, produced the conclusion that the earth of our planet could have been formed in no other way than as a belt around the equator

We had not then turned our attention to astronomy, but while reading a description of Saturn, in which the external ring is said to be "brilliant," it occurred to us that that radiation could be caused by nothing else than the gas of a metal, and that possibly the ring of Saturn contained the gas of the iron of the coal-bed formations In a series of papers published in "The Mining Journal" in 1851, we showed that Earth during her formation had passed successively through the orbits of all the more distant planets and that she would ultimately fall into the Sun

Consequently she must have undergone very considerable contractions and expansions Taking then first into consideration the astronomical part of the subject, we find that the Solar System consists of a number of planets, apparently of varying dimensions, revolving around the Sun, their centre, at something like relative distances beginning with the one nearest to the Sun—

Mercury,
Venus,
Earth,
Mars,
The Asteroids or Planetoids,
Jupiter,
Saturn,
Uranus,
Neptune.

The first two planets, Venus and Mercury, show us what will be the fate of our Earth, and a gruesome fate it is!

Mercury is whirled through space a hundred times faster than a rifle bullet, with one hemisphere ever turned towards the Sun, which hemisphere is roasted by a heat nine times greater than our fiercest tropical sun, while the dark hemisphere possesses a cold of 150° below zero This planet has no atmosphere to modify this terrific heat and cold, though astronomers tell us that formerly its atmosphere resembled ours The sun-baked side shows many irregular cracks, the result of the heat There cannot be any life on Mercury Venus, like Mercury, probably also now always turns to the Sun one hemisphere,

which is twice as hot as our tropics, the heat producing an uprush of air from the scorched surface, which is compensated for by an inrush of cold air from the dark frigid side causing a violent rainfall

Venus has very high mountains, the tops of which are visible above the clouds Venus is so enveloped in mist that nothing is known for certain of her rotation

It is supposed that the cold is so intense on the dark sunless hemisphere of Venus that the very air itself is perhaps liquefied, if not solidified

The planet which comes next beyond us is Mars When viewed in 1719, there was a belt, or so much of it as was seen, which extended half round him, to the end of which belt was a shorter one forming an obtuse angle In 1880 the surface appeared to be dotted all over with islands, the belt having disappeared

Professor Pickering thinks that Mars is certainly inhabited, but that the Martian form of life is probably lower than that on our Earth, and this idea is in agreement with our views Probably the Martians are in the Palæolithic or Stone Age, and as there is but little weight on Mars, they may be erecting those huge stone monuments, such as Stonehenge, &c, to the astonishment of later generations on that planet

Next to Mars come the Asteroids or Planetoids, which circulate within a space some 30,000,000 miles in breadth, lying about midway between Mars and Jupiter; but two or three pass quite close to Jupiter.

Eros, discovered in 1899, is the nearest to our orbit, being only 13½ millions of miles from us at the nearest point of its orbit, and by its help our distance from the Sun can now be calculated

There are now 800 of these little planets ranging from 15 to 250 miles in diameter, the majority being nearer the lesser limit It is supposed that the number of small unknown ones is countless, and they might include bodies as small as the meteors which frequently strike our atmosphere

Beyond the Asteroids comes Jupiter, the largest of the planets Unlike our Earth and Mars, he has no great angle of inclination which would give him different seasons, but rotates nearly at right-angles, 2° only The belts were first noticed in 1630, the central one being about 10,000 miles wide, and is

bounded on either side by a reddish-brown belt of the same width

Astronomers state there can be no weight on planets which, like Jupiter and Saturn, rotate at such an enormous speed of over 25,000 miles an hour, as this would tend to cause objects on the planets to fly outwards, and this tendency neutralises the force of gravity of the planet

Until 1850 there were apparently only two dark belts about the equator of Jupiter—one to the south, the other to the north—and "where the belts appear most dull is the body of the planet comparatively black, which is in part visible," it apparently not having occurred to the astronomical mind that, unless there had been a resisting medium underneath, with Jupiter's rotation, these belts must have collapsed This medium or "equatorial zone" we infer was not visible in 1862, whereas later the belts not only yielded to the equatorial zone, but the zone assumed all manner of colours A gigantic red spot or mountain made its appearance, then the belts returned, the red spot disappeared, to re-appear, in fact, rapid changes were continually taking place in the aspect and material forming the belts "In 1907 new spots (large) frequently appeared, then vanished, leading us to admit the operation of causes much more active than the heating influence only of the Sun."

"Jupiter possesses great inherent heat, and this also applies to Saturn, which shines partly by inherent lustre, spectroscopic analysis indicates that these two planets are each involved in a deep vapour-laden atmosphere, which is transparent."

Neptune, Uranus, Saturn, and Jupiter are markedly oblate, which seems to indicate that they are in a soft state The flattening at the poles of Mars and Earth hints that, some time ago, they also were in a fluid state

Saturn is the most beautiful of all the planets, the surface is not solid, but consists of cloudy or vaporous matter We shall refer to the ring further on He has now ten moons Beyond Saturn are two other bodies—Uranus and Neptune Judging by the spectra of these two last planets, the general conclusion is that they are surrounded by a deep dense semi-transparent atmosphere, of which hydrogen is an important constituent, of a constitution very different from that of Earth's atmosphere, and astronomers state that this dense atmosphere would produce great heat

Other bodies belonging to our Solar System are the comets, and these are various, or they, perhaps, visit us in different stages of development, for "there are comets without a nucleus, comets without a tail, comets the nucleus of which is opaque or solid"

Our idea is that comets are a loose aggregation of meteors, which contain the same elements as our Primary rocks, and that they become planets in the orbits the furthest removed from the Sun by the addition of more meteors

We have assumed that comets consist of the gases of metals corresponding to those that may be considered to be in the interior of Earth, which we conceive to be of much greater density than any of those of its crust, and that, the comet in taking the revolution of a planet, in the outer orbit of the Solar System, enters a medium very little lower in temperature than itself, where there can be no vapour

We know that when a comet approaches the Sun it decreases in size, sometimes so much so that its diameter is only one-tenth its usual length May not the Sun then cause the comet to become less gaseous and more solid each time it approaches him? In fact, to become more planetary and less cometary in its constitution?

To replace Mercury, in the Solar System, when that planet shall fall into the Sun, in the same way in which Neptune replaced Vulcan, Mercury's predecessor, we are justified in assuming that Encke's comet, which now revolves round the Sun in three and a third years, or 1,204 days (a period that decreases one-seventh of a day at every revolution), will by the number of these revolutions acquire the necessary conditions to enable it to take its place as a planet in the outermost bounds of our Solar System

Here this new planet will revolve like the other planets, and as it gradually approaches the Sun it will acquire its Primary, Secondary, and Tertiary rocks, vegetation, animal life, &c , and it will revolve in all the planetary orbits in succession, the present occupant of each of these orbits also advancing, in due order, spirally towards the Sun at long intervals of time Thus when Mercury falls into the Sun, Venus will be in the present orbit of Mercury, Earth in that of Venus, Mars in our orbit, and so on They all pass through the same phases of creation, maturity, decay, get used up then fall into the Sun, the comet-

making operation being begun, we conceive, in the orbit of Venus, whose oceans are now probably being evaporated, and this process is continued in the orbit of Mercury to the volatilisation of the metals constituting its crust, such as iron, copper, &c

What may be the Creator's motive in producing such a succession of planets we are at a loss to conjecture. Does each planet produce the same sort of life? Will there be on Mars wars, strikes, all the hurly-burly of events which occur on Earth? or will each planet evolve a higher type of being? We cannot tell, but it is truly world without end!

We note that a comet has been discovered by M Delavan, assistant at La Plata Observatory, Argentine Republic, which appears to move in an elliptical orbit, in a period of nine years, midway between the orbits of Saturn and Jupiter, and which seems to be a kind of link between comets and planets, as the nucleus appears quite sharp and stellar, while the gaseous envelope is very faint and at times disappears altogether

To the demonstration of the truth of our ideas we shall use no other evidence than that placed at our disposal by Science, applying our principles to its interpretation

Nor are we altogether singular in this cometary idea of the beginning of planets, since Herschel thought that Earth was at one time a nebula, and when making reference to the meteoric shower of 1866, Sir John Herschel, the son of the great philosopher, stated "that Earth approached the Sun in a spiral form, and that it and all the other planets would fall into that centre in their order."

In "Common Sights in the Heavens," by the late General Drayson, occurs the following interesting paragraph respecting comets —

"May they not be the agents for gathering up all those gases "or used vapours which may be thrown off by the Sun and the "various planets—celestial dustmen in fact—which come merely "when the conditions are such as to require them"

"The comet Encke has merely a less dense or compact form "than a planet and a more elliptical orbit This orbit is de- "creasing in ellipticity, whilst the comet is gradually assuming "more and more the course of a planet Let these changes con- "tinue during many ages and we shall at length have to call "this comet a planet"

Of the comet of June 1861, M Le Verrier and others stated that "it never approached the Sun—that its orbit was nearly "perpendicular to the plane of the ecliptic—that it was totally "dissimilar from all other comets—that in fact *it left our system "as a planet"*

Geologists are all agreed that our Primary rocks, gneiss, granite, porphyry, malachite, &c, were compounded under conditions of tremendous heat, greater than that of a furnace

Volcanic eruptions, hot water springs, the increase of heat as we descend into mines, all go to prove that the interior of the earth is still intensely hot

Hitherto no theory has been brought forward to explain the cause of all these phenomena, but on our theory that Earth began as a planet in the outermost bounds of our Solar System, where astronomers now allow there is tremendous heat, the compounding of the Primaries in the distant orbits of Neptune and Uranus, which provided the heat necessary to the formation of those rocks, follows as a necessary consequence

As Earth travelled on spirally through the orbits of Saturn and Jupiter towards the Asteroids the cooling of the exterior began, accompanied in the latter orbit by great contraction of the globe due to the cooler and more electrical orbit in which she was revolving

If our Earth has always revolved in her present orbit, where did she get the internal heat she still possesses? How were her Primary rocks melted and fused together if not in the distant hot orbits of Neptune and Uranus?

In the 'Poetry of Astronomy" Proctor states —

"In her extreme youth the Earth's whole frame was intensely "heated Her real surface was partly solid, glowing with white "heat, while the liquid portions were formed of molten rock"

Such a state of heat could only have been possible in the most distant orbits of our Solar System

Any inquiry into the origin of our Solar System must obviously be fruitless, it being, like the principle of life, beyond the comprehension of poor mortality

But assuming that each planet was at first a comet, and comets form part of our Solar System, to the surrounding of the nucleus of the planet with such compounds as granite, basalt, and other primary rocks, of which the materials are most intri-

mately blended, there must have prevailed a motion very different from that of the coalbed period of formation, a motion, in fact, of which gyration and topsy-turvy does not even convey an adequate idea, and, as already stated, there is some motion in Uranus that is not exactly reconcileable to astronomical notions We shall assume, therefore, that Earth s belt, when she was in the most distant orbits, was covered with the Primaries, although the materials of these rocks were not in actual contact with the insulating materials of the comet, as we have already suggested

EARTH IN THE ORBITS OF NEPTUNE, URANUS, AND SATURN.

CHAPTER II

Electricity the Mainspring of the Universe—All incandescent bodies are surrounded by an atmosphere which is electrical in proportion to the incandescence of the body—Electrical experiments of Messrs Crosse and Weeks—Gravitation not due to attraction of Earth but to repulsion from above—Facts proving this—Electricity the cause of cohesion and weight—Early condition of Earth's rocks—The Sun's composition—Temperature of planets and comets—How Earth's Azoic rocks were formed—First traces of life—Primary rocks, how formed—First vegetation—Saturn and his rings (illustrated frontispiece)—Quotation on Saturn

BEFORE proceeding with our account of Earth's evolution, it is necessary to say a few words respecting electricity and gravitation, as both of these were powerful factors in the various processes of Earth's formation

Electricity is the only agent of the Creator, and by it He produces life, disease, gravitation, light, cold, heat, cohesion, crystallisation, and weight

It pervades everything, it is in the air, in water (of which Professor Faraday said that a drop contained enough electricity to fell an ox), it is in all metals, rocks, &c &c, it fills the whole space of our Solar System under the name of "ether of space", it is, in fact, the mainspring of the universe

We assume that it emanates from the Sun for the following reasons —

Some years ago we noticed that a heater or a lump of iron, heated in an ordinary fire, becomes red, heated in a copper fire it become whitish, and if placed in a wind furnace it is luminous, and more so at the welding "white heat" of the smith's forge; while being hammered it throws off not only sparks but actually rays of light

It occurred to us that those rays were in every respect analo-

gous to those which flow from the charcoal points of a galvanic battery and from the flash of lightning, which latter, coming from the clouds, cannot be hot

From these observations we deduced the inference that "all "matter in an incandescent state is surrounded by an atmo- "sphere which is electrical in proportion to the incandescence "of the matter"

As the Sun is a highly incandescent body he must be surrounded by an extremely electrical atmosphere, the amount of electricity diminishing in proportion as we recede from him, but it is stated that the Sun's electrical influence extends beyond the bounds of our Solar System

This atmosphere is necessarily most electric halfway between the Sun's poles, where, by his rotation on his axis, there must be the greatest amount of matter—at his equator that is—around which we travel in our yearly revolution

That the air is electric, and that the amount of electricity increases as we ascend in it, was proved by Messrs Crosse and Weekes, the balloonists The latter, in a letter to us in 1847, wrote "If you send up three or four electric kites, or even a "greater number, in succession, adding each fresh kite to the "lower end of the string of its predecessor, the second kite will "be negative in relation to the one above it and positive to the "next one beneath, and so on of all the rest" This shows us that increase of cold and greater electrical condition in the atmosphere are alike referable to the surrounding regions, from which they both travel to the Earth, when their passage is not intercepted by clouds

As to gravitation, so far scientific men are agreed that it is the greatest mystery of Nature, they cannot explain what it is, why or how it acts, or what produces it, yet its action across space is instantaneous and perfectly regular

There is, then, this powerful agent, which is understood to imply a certain attractive force by which a small body is drawn towards a larger one, such as a stone, when thrown into the air, is said to be *drawn to* Earth by this force, but we assert that the stone is not *drawn to* the Earth but is *repelled from above* The effect is the same, though the cause is different.

Bodies which are similarly electrified repel each other, but those that are dissimilarly electrified attract each other, and to this law we ascribe gravitation

Its action is perfectly regular and in proportion to the amount of matter acted upon, a larger body calling forth a greater amount of repulsion and a smaller one less, each exactly in proportion to its size The observed movements of the moon and planets would also agree with the calculations of what they ought to be on the theory that they are repelled from above; a greater mass would receive more repulsion, and would consequently have more gravitation and a lesser mass would receive less, &c. Also a light body like a balloon, filled with hydrogen gas, which has hardly any weight, ascends because it is attracted to the upper regions being in an opposite state to them "Bodies which are dissimilarly electrified attract each other"

So long has "gravitation" been regarded as referable solely to an attractive force in the Earth that we can readily comprehend a difficulty in the reception of a principle of an immediately opposite character—*i e*, that it is due to repulsion from above, nor is it in our power, by argument alone, to remove a false impression of such long standing, such an effect can only be produced by time and reflection

The following facts are subversive of the doctrine of attraction of gravitation

Matter is not invariably attracted towards the centre of the Earth, as it is only at the poles and equator that the direction of a falling body is precisely towards the centre At all times, however, the line of descent is at right angles to the horizon, a fact established on mathematical data and about which no doubt has been raised

At the poles and equator the horizon is at right angles with a line drawn to the centre of Earth, and a falling body necessarily appears to be under the direct influence of that centre, although acted on only by the surrounding regions But in other latitudes, such as 45°, a line drawn from the surface to the centre of Earth is not at right angles with the horizon.

If, as we assume, gravitation be due to electricity, and therefore, to repulsion of a heavy body and attraction of light matter from above, the falling body must necessarily be at right angles with the horizon in all latitudes, but not in a direct line towards the centre of Earth, except at the Polar and Equatorial zones

Our globe is not a perfectly spherical body, but what is termed an oblate spheroid, of which the equatorial diameter exceeds the polar by 139 296 feet, or 26 geographical miles—a

difference equal to more than nine times the height of Mont Blanc or five times the height of the Himalaya Chain

If, then, the Newtonian hypothesis be correct, the greatest attraction should be where there is the largest amount of matter, at the Equator, but if gravitation be referable to the high electrical condition of the surrounding regions, it should be greatest at those points where cold has the greatest influence and where the line of perpetual frost is least removed from the surface of Earth, and such is the case attraction of gravitation is greater in the Polar regions than at the Equator as determined by actual weight and the vibration of the pendulum, so that an equal amount of matter weighs more in the Polar regions than elsewhere on Earth, as stated by scientific Polar explorers

Weight, then, in this orbit can be nothing else than an indication of the electric force by which matter is repelled from the surrounding regions As electricity is the cohesive force or bond of union in matter which increases in electrical condition in proportion to its density, electrically understood, it follows as a natural inference, that by compression or contraction, matter should increase in electrical condition and therefore in weight, and this is the case, and this law is practically applied in commerce

Flour kept a few days in a sack, in dry air, not only increases in weight by contraction, but will also make more bread than if used when fresh ground, hops increase in weight from 2 to 3 per cent when compressed into a sack or pocket, but gradually lose this increase if kept some time—three months or so A cubic foot of ensilage weighs 57 lbs, or 1 lb more than a truss of hay which measures 6 cubic feet, but what may be the loss of weight on a cubic foot of ensilage losing its cohesion when shaken out we have not ascertained

We could give many other examples in support of the fact that electricity is the cause of cohesion and of increase of weight in matter, but we must now continue our account of Earth's formation

Of all difficulties, the greatest is to unlearn or to free the mind from erroneous impressions acquired in youth

When Geology first became a study, the inquirer was erroneously under the impression that the ocean had always existed, and, on the testimony of the rocks, he naturally came to the conclusion that the first formed, or Primaries,

were of deep sea formation, since they were of immeasurable depth and afforded evidence of the presence of salt water when compounded But then there was also evidence that these selfsame rocks had been subjected to a very high temperature, to as great a heat, in fact, as that of a furnace in which metals are melted before crystallisation—a difficulty no attempt has ever yet been made to explain, whereas, in our nebular theory of the evolution of the Earth, the material of the Primaries and of all other rocks must have been in a gaseous state or vapours outside the Earth, and they were deposited long before the formation of the ocean, when Earth was in the orbits the furthest removed from the Sun, where the temperature is tremendously hot, as is the case with Uranus and Neptune at present

And as if to set this very important question at rest, it has been correctly concluded that ' as the total mass of the land " of our Earth is about ten thousand times greater than that of " the waters connected with it, it is more probable that the " original fluidity of the earth was due to heat rather than to " aqueous solution The heat was very great, as the present " temperature at the Centre of the Earth, supposing a regular " progression in the increase downwards, exceeds 3,500 of " Wedgwood's pyrometer, or 450,000 Fahr "

It must not, however, be understood that in the use of the word " heat " there was at this period, or is now at the central part of our Earth, anything approaching to chemical action, such as is understood by combustion, but merely that the whole of the materials composing this globe were intensely hot or highly negatively electric—the principle in Nature which combustion renders evident, and the opposite to which is the intense cold which attends the de-crystallisation of a salt the first action causing a demand for electricity, the second setting free a greater amount than surrounding conditions demand.

The Sun, the controlling centre of our system, must be composed of gases infinitely more dense than would be the gas of the most dense metal we are acquainted with, and he must be in the highest possible condition of heat, " his surface tempera- " ture being some 2,000 centigrades above the boiling-point of " carbon, a little way within his body it may exceed the point " at which increase of pressure can produce the liquid state in " any substance "

It is now agreed by scientific men that the temperature of the planets beyond Mars—*i e*, Jupiter, Saturn, Uranus, and Neptune—increases in intensity agreeably to their distance from the Sun, in fact, that they have a temperature best calculated to contain the gases of the materials necessary for the formation of their several compounds, such as rocks, minerals, &c The regions beyond Neptune, then, must be very intensely hot, the heat, we assume, being of the nature of steam or of a heating haystack, not that of combustion, unless it be of the gases generated by that phenomenon

The reader may ask why the most distant orbits and planets of our Solar System should be so intensely hot?

The reason is that the Sun being highly incandescent is surrounded by an intensely electrical atmosphere, the amount of electricity in space (the Sun's atmosphere) decreasing in proportion as we recede from him

The high incandescence of the Sun sets up a demand for electricity, which consequently flows to him on the same principle that a high-pressure boiler in action attracts electricity to itself (This latter statement is a fact which we proved publicly in 1845 at the Polytechnic Institute, London, in an experiment with a hydro-electric boiler)

Mercury, Venus, Earth, and Mars then revolve in electric orbits, the amount of cold in the orbit decreasing in proportion as that orbit is further removed from the Sun, because there is less electricity the further we go from the Sun

Heat is simply the result of a small quantity or absence of electricity, therefore, as distance from the Sun increases and the amount of electricity is less in space, the orbit is warmer, as in the Asteroid orbit, and further off still from the Sun, in the orbits of Jupiter, Saturn, Uranus, and Neptune, heat increases in proportion as their distance from the Sun is greater

In the orbits of Uranus and Neptune the heat must be intense, due to absence of electricity in space, though each planet must be surrounded by its own electrical atmosphere

Comets, we conclude, are composed of gases similar to those at the interior of our Earth, and, as a matter of course, are surrounded by an atmosphere electrical in proportion to their heat They mostly have a tail or tails, and, when approaching the Sun, are followed by that appendage, but are usually preceded by them when receding from the luminary, from which

it may be inferred that the tail consists of particles which reflect the rays of the Sun passing through the nucleus

Thus far, to the best of our ability, we have cleared the way to the period when Earth entered in an incandescent state on the outermost bounds of our Solar System as a comet, which is an aggregation of meteors

Then, having taken the orbit of a planet, Earth entered a medium that admitted of the condensation of her gases, and of them being surrounded by an insulating medium, by rotary motion (centrifugal) accumulated round this nucleus as a belt, that which we designate the matter of the primary rocks, the materials of granite, basalt, trap, syenite, and porphyry, &c, which are composed chiefly of the simple minerals, quartz, felspar, mica, and augite, which again are composed of clay (alumina), lime, and sand (silica), the bases of all rocks, silica in combination with oxygen forming more than half the rocks of Earth's crust

Earth's gases, then, would necessarily occupy positions agreeably to their "specific gravity"—the heaviest at the centre, the lightest at the exterior—the latter, naturally negative, such as nitrogen, protecting the condensable gases from the electric atmosphere by which the whole was surrounded Ultimately, however, this electric condition exercised a cooling influence on the nearest condensable gases or compounds such as vapour—which became the carriers of electricity to the more ponderable bodies beneath, and in its operation liquified these, and ultimately solidified them into a crust, surrounded by an atmosphere of carbonic acid, vapour, and nitrogen, our atmosphere of air not having then been formed

Of the nature of this crust there does not appear to be any great deficiency of information, or, at all events, any great difference of opinion amongst those who have made geology their study, although its condition is a question that has not received the amount of consideration that its importance demands, but which, we think, is readily to be solved by reference to the properties which the matter composing the earth is known to possess, and the laws of motion

There being at this period no crystallising influence on the matter thus formed, and it being composed, geologically speaking, of the earths and soluble salts, many of them highly deliquescent, such as the muriates or chlorides, as the vapour con-

densed on the surface of the globe, the composed mass must necessarily have been of a soft or spongy nature, floating, as it were, on the more dense and liquid body beneath, and being subject, therefore, to the laws of motion, as the formation went on, and induration took place, this mass would accumulate within certain limits of the Earth's greatest circumference

To all the first rocks the name of Azoic, or without life, has been given, because they contain no organic remains, and, if for their orbit, a space of a few thousands of millions of miles be allowed, they should respectively have ample time to accumulate matter and to consolidate sufficiently whether by absorbing a portion of the electricity surrounding the new planet or by the enormous centrifugal force of the planet of that orbit—*i e*, a rotation of over 27,000 miles an hour—matters not

In reference to Earth's rapid rotation on her axis, Mr George Darwin, Professor of Mathematics at Cambridge, says that fifty millions of years ago Earth rotated in five hours, or five times as fast as now, and therefore had very little gravity on her surface then

Besides which, Neptune was in 1891 apparently nearly eight thousand miles larger in diameter than Uranus, and, if so, during Earth's journey from the orbit of Neptune to that of Uranus, there must have been contraction in her bulk

Outside the Azoic rocks are the Lower and Upper Cambrians, which contain the first traces of life, consisting of sea plants, zoophytes, polyparia, and a variety of shelled marine animals, all of the lowest order, this being the result of the small amount of electricity in the most distant orbits—electricity being the cause of life

Resting on these rocks are the Lower and Upper Silurian, followed by the Devonian system or Old Red Sandstone Then comes the Carboniferous and great Limestone deposit—a crystalline rock, the foundation of our coal-beds, which was deposited when Earth was in Saturn's orbit some 900,000,000 miles from the Sun, whilst most of the subsequent deposits of carbonate of lime, such as Bath and Portland stones, are still of a soft nature, thus proving that they were deposited under conditions differing from those of the earlier rocks Of the constitution of the primary rocks there appears to be some difference of opinion, it being stated that the Laurentian, of great but un-

known depths, are of gneiss, and of course highly stratified, whilst granite, basalt, &c, are not stratified—a fact which is explained by the difference in the manner of rotation of Neptune and Uranus, the latter planet having a gyratory rotation, as indicated by his moons, which would produce unstratified rocks such as granite and gneiss, &c, whilst in the orbit of Neptune the rotation is not gyratory, thus allowing the older Laurentian rocks to settle in strata

Granite, then, formed the base of Earth's crust, and on it was deposited the lime, converted into a carbonate of lime by the condensed vapour, which brought down the acid from the atmosphere through which it passed, and here commenced an operation which laid the foundation for the formation of that store of wealth, coal, which abounds in many parts of this highly-favoured island, and to which may be mainly, if not entirely, attributed the rapid progress we have made in science and other departments of civilisation

All matter has some peculiar property appertaining to its kind, and although on the discovery of this property we may be at a loss to understand the object of the Creator in imparting it, subsequent investigation generally reveals the wisdom of His purpose It has long been known that whilst all salts—and, it may be said, all other matter—are more soluble in hot than in cold water, the solubility of lime decreases with the increase of temperature—a condition that admirably fitted it to the fulfilment of His purposes in the early part of creation

The water, on contact with the solid matter, was raised to a high temperature, or the boiling-point, and, therefore, was a rapid solvent for all the soluble salts, and would, consequently, free the lime, which was rapidly deposited free of all impurities, its insolubility being also increased by its conversion into a carbonate, and as at this period there could have been no change of electrical condition in the atmosphere, and, consequently, no gales of wind, the formation of the carbonate must have been uniform within the limits where the deposition went on, had there not been a great disturbing cause, but at this period, there being no crystallising influence, the water readily gained access to the hot bed beneath, and being rapidly generated into steam formed openings through which poured out the steam, carrying with it large quantities of the powder which accumulated in the

neighbourhood of these vents into hills, which hills increased in density as the accumulation of matter proceeded, and ultimately became compact masses of very considerable height, forming between them extensive valleys which, as the temperature of the mass decreased, became lakes of water, saturated with salts of different degrees of solubility

Agreeably to geology the next formations are the Lower and Upper Silurian and the Devonian, the Silurian consisting of clay and the Devonian of sand only, in connexion, however, with a limestone formation, having abundant traces of the lower grades of the animal kingdom, so that, so far, the materials engaging our attention are lime, alumina, and silica

We have already considered the very peculiar property of lime, being less soluble in hot than in cold water, a property that would not fail in ensuring its rapid deposition under the conditions that existed in the first formation of the Earth's crust, and we will now endeavour to show that there were other conditions which tended to increase the operation of this principle

As we ascend in the atmosphere, the mercury falls in the barometer, indicating a decreased atmospheric pressure in higher altitudes, and it is likewise established as a rule that the boiling-point of water is regulated by the amount of pressure on its surface, and, therefore, the temperature of the boiling-point decreases with decrease of pressure Atmospheric pressure under existing conditions is about 15 lbs on the square inch, but the atmosphere of the period we are now discussing must have contained, as vapour, a great portion of the water now constituting the ocean, and also, as carbonic acid, the whole of the carbon entombed in the coal-bed formations which increase of matter must necessarily have imparted to it an increase of pressure of several pounds to the square inch, and as decrease of pressure decreases the boiling-point, this increase must have imparted a very high temperature to the semi-fluid mass then surrounding our Earth

There were then at this period in operation two distinct forces or conditions—decreasing temperature and decreasing atmospheric pressure, but at this period the atmosphere could not have been electric, and, therefore, as it decreased in bulk, the electrical condition of the upper regions exercised an increased influence with the decrease of the intervening mass which

insulated the earth from it—an increasing and powerful auxiliary to the operation of the other two conditions

The lime, then, as already observed, deposited under the influence of a high temperature, and its powder being carried up by the steam, formed extensive valleys or pits Ultimately, however, as the temperature decreased and the water increased, the alumina and silica followed in their turn, each drop of condensed vapour bringing down from the upper regions its portion of electricity, which on being imparted to the silica constituted the grains of sand—sand being clearly an original formation and not the detritus of former rocks

As we have already observed, there was at this time no change of electrical condition in the atmosphere, and, consequently, no gales of wind In reference to this formation, we are informed that "the prevalence of the slatey character shows "that the progress of formation has not been varied by much "original disturbance, and the depths of its beds indicate the "probability of some portion having been deep water, or rather "semi-pelagic deposit," an apparently well-established conclusion, strictly in accordance with the principles we conceive to have governed this formation

Other geologists suggest that these rocks have been hardened by compression while under the influence of a high temperature, a conclusion which a little consideration will show to be the reverse of truth All matter that is hardened under the influence of high temperature will stand the action of fire, while substances indurated by cold or electricity decrepitate when exposed to heat Limestone, which is acknowledged to have been formed apart from "heat," rapidly yields to the influence of fire, which has a similar action on shale or slate, the Silurian formation If a piece of granite be put into a crucible or placed in an ordinary sitting-room fire, in about fifteen or twenty minutes it will fall to dust and expose to view its constituent parts, which may be thus separated from each other In fact, the influence of fire on all these substances and on flint, which is of more recent formation, is alike destructive to their crystallisation or combination, which took place under the action of electricity

All works, however stupendous, have a commencement, and we have endeavoured to define the conditions under which were deposited certain portions of the earth, as a nucleus to the

further accumulation of matter that should prepare a soil fit for the existence of both the animal and vegetable kingdoms

What, then, were the conditions that induced this accumulation?

The nucleus having near its base a bed of lime, which is a bad conductor of heat, was insulated from the heat of the central portion of the globe, and would, therefore, agreeably to conditions which govern crystallisation, necessarily accumulate from the semi-fluid boiling mass the matter held in solution, in the order of solubility, the less soluble salts or matter being the first deposited

When the water confined within the hills of lime, to which reference has already been made, was sufficiently reduced in temperature, life was given to certain classes of animals, the lowest in the order of creation, which not only greatly assisted in concentrating the matter but also in securing a disposition that should render it suitable for the first of vegetable life

The principle of life is beyond the reach of the human understanding We can reason only on matter as we find it and the properties it possesses Electricity we think, is the life-spring of both the animal and vegetable kingdoms, and is also essential to their existence Life, therefore, dawned only when the soil became sufficiently cool or electric for its preservation, and the low electrical condition of this period admitted only of the existence of animals the lowest in the order of creation—such as polyparia, crinoidea, mollusca, &c

We have already shown that the water now constituting the oceans once formed part of the atmosphere, and that during the condensation of this vapour there must have been a progressive decrease in the pressure of the atmosphere on the *Earth's* surface, and we think it will be admitted as equally demonstrative that the collection of the vapour in a condensed form could not fail in exercising an increased influence on that portion of the globe not covered with matter

There were, then, two forces in operation simultaneously tending to the elevation of the land decreased pressure on its surface and increased pressure on the surrounding mass, which, from water being a bad conductor of "heat," and of that electrical condition understood by "cold," must long have continued in that pulpy state, and would, therefore, readily yield to the

pressure of the accumulating water and necessarily slowly raise the land

On the tops of these hills vegetation first took root, and being composed of mosses, or plants of a creeping character, rapidly extended on the water or semi-fluid then composing the lakes, and ultimately formed a compact mass that would admit of the growth of ferns and plants of larger growth

It is a law in vegetable physiology that the roots of plants ramify in proportion to the distention of the branches, therefore, as the beds increased beneath, the ferns would assume the character of trees, and, consequently, could not fail, as they increased in size, in depressing the "bog or peat mass" below the surface of the water

Electricity is the cause of crystallisation and the sustaining agent in vegetation, and, therefore, so long as the water was covered with vegetation, which disposed of the electricity, no condensation of the salts could take place, but immediately the mass was depressed below the surface, the electricity, brought down by the condensed vapour, would act on the salts held in solution

We are informed "that in several places erect stems of trees "are found with their roots still fixed in the shale beds and "crossing the sandstone beds at almost right angles," which sandstone beds would naturally depress the mass to the bottom of the basin

That the land has progressively risen, and as progressively extended, its geological features place beyond a doubt, and, therefore, in addition to the two forces to which we have referred, there was also the gradual increase of the land upon the water, and its consequent displacement, and the consolidation of the matter as it increased in bulk, all of which operations would tend to the conditions we have proposed But if these be not deemed sufficient to account for the alternate gain of the water on the land, and the land on the water, the influence of gravitation which gradually increased, and to which we shall have occasion to refer hereafter, will relieve us of all difficulty in accounting for these phenomena

Humboldt, "On the Superposition of Rocks," very pointedly makes reference to limestone, of the primary rocks, lime being white. The base of clay also is white, clay-slates being black, and although slate is white, from the black material hydro-

carbons are distilled, and of which hydrocarbon there are inexhaustible springs or wells in many parts of the world, whilst quartz are both black and transparent The black limestone being "transition" the other blacks may be of the same orbit, the mottled limestone being of the coal-bed period

All which facts indicate that when the rocks were compounded their materials must have been in the state of gas, the earth or belt round the nucleus being in an opposite or condensing nature

In this compounding orbit is now the planet Saturn, surrounded by an appendage that has excited the astonishment of astronomers ever since its discovery This appendage, or ring as it is called, consists, according to Sir David Brewster, in "More Worlds Than One," of —

		Miles
1	Exterior diameter of exterior rings	176,418
2	Interior „ „ „ „	155,272
3	Exterior „ „ interior „	151,690
4.	Interior „ „ „ „	117,589
5	Equatorial „ „ Saturn	79,100
6.	Distance of interior ring from Saturn	19,000
7	Breadth of the division between the rings	1,791
8	Thickness of the ring . .	220
9	Inner diameter of crape ring	88,190

In order to give a clear idea of Saturn's rings we quote Mr Scriven Bolton's beautiful description in "The Illustrated London News" of October 4, 1913 —

"This beautiful planet is composed of such light material "that it would float like oak on water Hence the conditions "of existence are, as Sir Robert Ball says, 'so unlike our own "as to render conjecture hopeless' No such tracts as land and "sea exist on that mighty Saturnian globe, nine times greater "in diameter than our Earth"

"We discover simply a vaporous atmosphere tormented by "an intensly heated core for ever hidden from mortal gaze "Cloud-vapour is incessantly shot vertically into the upper "atmospheric layers by internal convulsions, and the planet's "swift axial rotation distends it into light and dark parallel "bands, which encircle the globe"

"The rings are composed of nothing more than a flight of "myriads of small particles round their primary, the inner ones

"revolving once in five hours fifty minutes, the outer ones in "ten hours The globe is visible through the innermost or "crape ring, since the particles here are but sparsely scattered"

"Not improbably we are witnessing another moon in process "of formation"

We are further told by Sir David that "according to Mr "Bond, the power which sustains the centre of gravity of the "ring is not in the planet itself but in the satellites, and the "satellites, though constantly disturbing the ring, actually sus-"tain it in the very act of perturbation", but on our principles it is evident that the ring must be sustained by the same power which governs the other action of the planet, besides which, that which is vapour in the orbit of Jupiter, may in Saturn's further orbit be gas, and, if so, those rings are nothing more than the boundary of the planet's atmosphere In this view of the question, Saturn's atmosphere is twice the diameter of that of Jupiter, and, if so, the planet or belt itself may be larger in proportion

EARTH IN THE ORBITS OF SATURN AND JUPITER.

CHAPTER III

Oxygen of Carboniferous era—Coal measures and their vegetation—Illustration (Fig 2) of a lump of coal—The Geology of the Coal Period—How coalfields were formed as rings or bands in Saturn's orbit—Petroleum—Sections of Coal Measures (Fig 3)—Lignite—Bituminous coal—How iron sulphide permeated coal—Coal basins formed by contraction of Earth's belt—Permian formation—Sandstone of Coal-bed period—Why rocks show evidence of salt before the formation of salt water—Saturn's moons formed out of his rings—Jupiter's orbit the saliferous era

It has frequently been surmised that at the period of the coal-bed formation, which we conclude took place in Saturn's orbit, to the production of such an enormous mass of carbon the atmosphere must have contained an unusual amount of carbonic acid—a conclusion, of course, arrived at on the assumption that Earth had always been in her present orbit Now, however, the planetary orbits must give way to the geological, and there can be nothing irrational in the supposition that the orbit was that of carbonic acid

The vegetation of the coal-bed period must have been plentiful and luxuriant, and we know that carbonic acid is received by plants as food, the influence of vegetation on this gas solidifying the carbon and liberating the oxygen, the proportions of which are as 6 to 16, or, by actual weight, as 27 to 73, therefore, for every 27 tons of carbon deposited in the coal-beds and remaining vegetation throughout the world there must have been liberated to the atmosphere 73 tons of oxygen

As oxygen is matter, and all matter is subject to the universal law of gravitation, the specific gravity of this gas (1 1111) would assign to it a position, as generated, between the carbonic (1 500) and nitrogen (0 9722) atmospheres The mass of oxygen thus liberated is ignored by geology, but, nevertheless, it must be taken cognisance of and accounted for.

This gas then—oxygen—would form a part of the planet's

atmosphere independently of that of orbit, and as generated would range itself outside the carbonic acid accumulated from the orbit As illustrative of our views of the cumulative influence of rotation, and of the extent or quantity accumulated, we cannot do better than adduce the testimony of Hugh Miller By that great authority we are told 'the coal measures where "deepest and most extensive, consist from bottom to top of "buried platforms ranged like the sheets of a work in the course "of printing, that after being stamped by the pressman are "then placed horizontally in a pile Another remarkable cir-"cumstance, which seems a direct result of the same physical "conditions of our planet, is the vast horizontal extent and per-"sistency of 'platforms The Appollachian coal formation "in the United States has been traced over an area considerably "more extensive than of all Great Britain, and yet there are "some of its beds that seem continuous throughout The great "Pittsburg coal seam of this field—a seam wonderful in its "thickness from 8 to 12 feet—must have once covered a sur-"face of 90,000 square miles And this characteristic of per-"sistency, united to great extent in the various platforms of the "coal measures, *which accumulated one surface platform over* "*another* for hundreds and thousands of feet, belongs 'to a con-"dition of things no longer witnessed on the face of the globe' "And on applying a magnifier to a piece of burnt shale, half "an inch thick, we counted ten distinct layers, each of which "was composed of a number of films which baffled all attempts "at enumeration"

The above was evidently written before Humboldt directed our attention to the *black* limestone of the primary rocks, and whether coal be the result of chemical action with carbonic acid and vapour, or hydrocarbon and vapour, the reader will see that not only our interpretation holds good but also that in the orbit of Saturn the limestone is no longer black but mottled The shale, however, in combination with the coal is black, but produces a white ash.

Of the "vegetation' *of the coal period* little has been said to our purpose The "plants" were all of the lowest grade and of "gigantic stature, the mosses," as we are told, "even "attained a height of from 60 to 80 feet, the leaves measuring "some 20 inches in length" And if, as is supposed, they stood upright, there was but little gravitation, and of wind none at

all Respecting the roots, too, there appears to be some difficulty, and they are said to be always in shale It is true we have never inspected a coal mine, but our search for impressions of roots in shale has ever been fruitless, and if the beds of some 50 feet thick are not, as it is said, of one seam, but of several divided by thin bands of shale, it is conclusive that in such a material they could be of no avail to sustain the plants, and if there were no wind or other influence to break the plant down, the roots evidently were not wanted, whilst to contemplate the growth of a seam of from 8 to 12 feet thick of now densely compact matter, covering thousands of square miles, as being produced from one set of roots, is rather a tax

FIG 2 —Lump of coal

on the imagination Besides which, had the seams been so produced, the impregnation of every particle of coal with the iron sulphide would have been next to impossible.

Nor does our difficulty end here In the accompanying sketch (Fig 2) of a lump of coal, 4 inches high, the seams or layers are divided not by shale but by a band of iron sulphide, half an inch thick, and where the band appears to terminate, in its turn it is divided by a very thin layer of coal, affording unquestionable evidence that when the sulphide *intruded* it was in the gaseous state, whilst another specimen has one side in alternate layers of the sulphide and coal All which difficulties disappear on the application of rapid

rotation, with, of course, nebulous contributions of gaseous matter, conditions which prevail in Saturn at the present time

The stigmaria is one of the most common of all plants in the coal formation, and we are informed that not a mine is opened nor a heap of shale thrown out, but there occur fragments of an irregularly compressed roundish form, apparently portions of a stem, marked externally with small cavities in the centre of slight tubercles, arranged irregularly but somewhat in a quincuncial manner The axis of these fragments is often hollow, or different in texture from the surrounding part From the tubercles arise long riband-shaped bodies, said to measure as much as 29 feet There are portions of the extremity of the arms of a huge dome-shaped body, which divides into twelve limbs, each of which spreads horizontally from the edge of the dome, usually dividing into two arms

Sigillaria comprehends all those columnar gigantic stems which occur commonly in the sandstone of the coal in an erect, or nearly erect, position, but which are prostrate and crushed flat in the coal shale, and which are marked by flutings, with a single row of small scars between them In diameter they vary from 6 to 36 inches, and must have been full 40 or 50 feet high It is believed, from the very compressed state of many of these specimens, that these plants must have been of a very soft nature, and from the general absence of scars of a large size that they must have been very little branched

These plants, the most common of this period, convey a general idea of the vegetable kingdom, and their nature shows clearly that they are not the production of the land, but are admirably suited to the conditions we have proposed The stigmaria, in the first instance overrunning the semi-fluid composing the liquid, and the sigillaria having taken root in its accumulated mass from its being devoid of branches, and being of great height, was calculated to exercise a depressing influence As there was no wind and very little gravitation, its soft texture would be quite sufficient to sustain its superincumbent weight

While these coal fields were being formed, ages passed away, the temperature of the water gradually decreased, and the nucleus of earth gradually increased, the cooling of the surface being brought about by the constant repetition of evaporation and condensation of the fluid now constituting the ocean

Dr Whitfield, who annually visited the Tropics in search of plants, informed us that in Gambia there are numerous sorts which thrive on the surface of the water *without any connexion with the soil*, a property which may have prevailed with the earlier kinds of the vegetable kingdom, which were very light in texture As the water of that period held in solution all the elements that now constitute the soil, it was admirably suited to support and nourish plants such as the stigmaria

The carboniferous formation exhibits but a scanty zoology The mountain limestone deposited at the commencement of the carboniferous era abounds in polyparia, crinoidea, and mollusca, but in the coal-beds there is only a limited variety of shell molluscs, with fragments of a few fish found in the shales which alternate with the layers of coal

Seams of coal are of various thicknesses Thus in Staffordshire are some from 30 to 45 feet thick, not, however, one continuous seam of coal, but several, divided by what miners call "bands"—very thin layers of clay, shale, or slate Some coal contains layers of iron pyrites, whilst we know that all coal is more or less impregnated with iron sulphide, which permeates the whole mass

In America there are coalfields in which the seams of coal, uniformly from 8 to 12 feet thick, extend continuously over an area of several thousand square miles

All the roots of the plants of the coalfields of England, it is supposed, were in shale, but there does not seem to be any evidence of the plants having had roots Certainly they were not necessary to the production of the plants, and it is clear they would have been useless as supports for the plants, in the very thin bands of clay, shale, or slate of the Staffordshire seams

We assume, then, that the coal plants grew as clouds, between a ring of shale on the one side and rings of sand on the other, unlimited in space, the rings and clouds of plants extending, perhaps, some hundreds of miles high and surrounding such a globe as Saturn (and Saturn has his rings, under which we presume coalfields are now being formed) The rings of shale, sandstone, slate, and other strata of a coalbed formation, with the intervening layers of vegetation, would, of course, be vertical to the nucleus of the planet, they would turn in a W and E direction—to the Sun, that is—and would extend laterally

N and S, whilst each of the belts would represent a distinct coal-bed formation

In proportion as these rings attained maturity and the vegetation accumulated underneath, they would acquire a tendency to draw together, this tendency increasing with the increase of matter, and when they were contracted to the utmost, the mass would be only a few miles wide and some hundreds—or perhaps thousands—of miles high Such a formation would have a tendency to topple over, the vegetation of the coal-bed being periodically destroyed by a downpour of iron sulphide in the state of gas from the ring (and nearly all coal is permeated by this sulphide) However small might be the gravitation influence in so doing, the mass would necessarily break up and form a number of coalfields, which, as they deposited, with increase of gravitation due to the planet approaching nearer to the Sun, would necessarily displace the liquid matter and give the appearance of their having been formed in basins All the matter we are considering would be carried towards the Equator by the rapid rotation of the planet

A similar process of deposition would take place in the following geological formations up to the Wealden, with this difference, that there would be a larger quantity of water and of salts on the approach of the planet to the ocean forming orbit, increase in the gravitating influence, and a consequent increased tendency to dislocate or break up the belts, the salt beds replacing the coal beds, although these latter were not altogether wanting when the planet entered the orbit of Jupiter We conclude the gas of iron is in the bright part of Saturn's rings and that of sulphur in the dull parts

From whatever source coal may have been derived, evidently petroleum must have had a similar parentage, whatever may now be its condition, whether solid or liquid, and in a work on Physical Geography, it is said to be in France and Italy—in Europe, Siberia, shores of the Caspian, Persia, Burmah, Japan —in Asia, in the United States and Canada—in North America, the wells of America and of Asia being too notorious to need more than a reference to them They are all, we believe, in primary rocks

In "The Economy of Vegetation," Dr Darwin (a man of whom England *may* well be proud) surmises *that a natural distillation of it in the bowels of the earth must have taken place*

at some early period of the world, and if coal were of vegetable origin, it is difficult to understand how petroleum could otherwise have been produced, whilst if, on the contrary, coal be the result of chemical growth, from whatever cause, there can be no difficulty in comprehending that by a very trivial change in the conditions petroleum should be produced, whilst, so far as we are aware, all the compounds of petroleum are not near the coal-bed formation strata Certain it is, however, that by a "section of the strata to the low main coal of St Anthon's colliery," the rock on many of the seams of coal is of a pure white, thus indicating that the coal has not undergone any great chemical change since its deposition

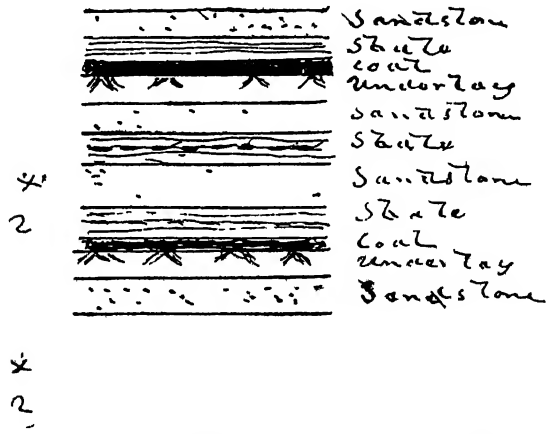


FIG 3 —Section of coal measures (Fig 65, from Huxley's "Physiography")

In "Physiography," by Huxley, it is said "The succession "of strata or *measures* cut through in a colliery is generally "similar to that represented in Fig 65, but the series may in- "clude hundreds of separate beds The roof of the coal or "the rock immediately above the seam is commonly a shale, "which, when split into layers, is very frequently found to en- "close impressions of plants"—the roots being, as stated by the late Sir W Logan, in a layer of shale, known as *under clay* or *seat earth*, as shown in Fig 65 It is also said by Professor Huxley that "there are three directions perpendicular to one

"another in which the coal may be divided", in fact, we presume in the same manner as several minerals split

There is, however, a kind of imperfect coal which shows by its texture that it has been formed from wood, so liqueous, indeed, is its texture that the coal is commonly called lignite In this country such coal is found only in insignificant quantity at Bovey Tracey, in Devonshire, but in other countries *which are poor in true coal* lignite occurs in large deposits and is an important fuel

It would be futile to speculate on the length of time the coal-bed formation took, but however long it lasted, it is conclusive that had it not been arrested by some process, the earth would have been nothing else than a gigantic mass of carbon Whatever may have been the cause of the sudden check, it is equally conclusive that it also exterminated the vegetation, the cause of the coal-bed period, and that this period was followed by the deposition of a material—*i e*, salt—in mountainous masses, to the composition of which hydrochloric acid or chlorine constitutes an essential element These facts are in no way accounted for on the theory of the cooling of the Earth as she advanced to the Asteroid orbit, but both the coal-bed formation and the deposition of salt were the result of Earth's revolving for some hundreds of thousands of years in Saturn's orbit and subsequently in Jupiter's

That the matter of Earth's crust (Primaries and Secondaries) was deposited as a belt around the Equator, there is conclusive evidence, and the enormous velocity of Saturn's rotation, which takes only ten hours at a speed at the Equator of over 22,000 miles an hour, leaves no room for doubt as to the manner of the collection of the matter before deposition, that, in fact, his ring may be taken as being typical of the materials of the earth-belt underneath All bituminous coal, more or less, is permeated by iron sulphide, and if the outer bright ring of Saturn contains, or did contain, the iron, and the dark one below vapour of sulphur, we can understand that the fall of the iron gas through the vapour should form the beautiful sulphide of the coal-bed—a material man cannot imitate, and, so far as we can see, it must have been by some power of this gas that coal was periodically permeated

Geologists say there was some great convulsion after the completion of the coal-bed formation The "coal-beds gener

"ally lie in basins as if following the curve of the bottoms of "the seas There is no such basin that is not broken up into "pieces, some of which *have been allowed to sink*, causing the "ends of strata to be in some instances many yards, and in a "few several hundred feet, removed from the corresponding ends "of neighbouring fragments"

"These are held to be the results of volcanic movements "below, the operation of which is further seen in numerous "upbursts and intrusions of fire-born rock (Trap) That these "disturbances took place about the close of the coal-bed for-"mation and not later is shown in the fact of the next higher "group of strata being comparatively undisturbed"

If Earth were originally a Comet or other fiery mist, evidently at this early period an ocean is quite out of the question, and the volcanic era as yet is a very long way off But if, as already observed, Saturn's atmosphere be larger than Jupiter's, the contraction of the belt in the planet's onward progress spirally towards the Sun would account for all the above geological facts

This brings us to the close of the great platform formation illustrated in the steppes of Russia, the prairies and coal mines of America, and with it comes the extinction of a class of animals which prevailed from the Silurian epoch, the first tràces of their successors (reptiles) being in what is termed the Permian formation, respecting the origin of which there appears to be much doubt

Associated with the primary rocks there are what are called metamorphic, such as gneiss and slate, which are supposed to have been melted by heat and thus changed in their nature, but these rocks, being in most beautifully uniform layers, would appear to afford evidence of a high centrifugal, or of a succession of layers deposited under that influence

We have in our possession specimens of sandstone of the coal-bed period, the several layers of which are separated by well-defined films of black matter, thus affording evidence that when being deposited, or even before, each slab must separately have passed through black dust or vapour of some kind, an operation that clearly could not have taken place in a deep sea formation But if these slabs were of nebulous formation, all impossibility disappears, the more especially when it is stated "There is observed at very great distances *a parallelism of beds*,

"the direction of which the type is manifested amidst partial "disturbances and which often remains the same in the primi- "tive and transition formations" As every seam of coal has its underclay, in which are the roots of the *plants of the coal-bed period*, the same underclay should also contain the protoplasm of the animals of that period

When Earth left the orbit of Jupiter and ceased to rotate at 26,000 miles an hour, the slower rate of rotation would cause the belt of land around her equator to widen out, causing the destruction of the animals living upon it, or they may have died out from change of atmosphere Be that as it may, between the reptiles of the orbit of Jupiter and the first of the warm-blooded or breathing animals there is said to be a long period of time, or a blank, unaccounted for by geology

In reference to the widening-out of the Earth's belt of land due to slower rotation, we would point out that the acceptance of facts without a directing principle leads to error, and we believe that the fact of fish having been found by Hugh Miller in the Old Red Sandstone was accepted as evidence of those fish having lived *before* the coal-bed period, whereas if the belt formation of our land be accepted, the Old Red Sandstone would have been a kind of intermediate period between the Primaries and the coal-beds, and it is possible that that stone, whilst partaking of the rotation formation at the depression of the belt, may have extended beyond the belt formed exclusively by that action, and, if so, those fish may be of a much subsequent period

It does not appear how fish should swim without the presence of water, which did not exist when the Old Red Sandstone was deposited

We have said there could not have been any ocean up to this period of Earth's history—the Permian, but, nevertheless, *all the rocks* bear evidence of salt water, the fact, no doubt, that induced the conclusion of them being of ocean formation, and the beds of the platform formation being of enormous thickness or depth, it was naturally concluded that the sea was equally deep Let us see if we can explain these two facts

The poles of a galvanic battery have not only the power of decomposing water but will actually convey the elements of that fluid into separate vessels, as demonstrated by Davy, and as a spark and radiation, which are positive, combine these ele-

ments, we must assume that the decomposing influence must be in an opposite state, whilst magnetism has to an enormous degree the electrical influence of cohesion

Without, then attempting to define what may be the conditions which govern the several properties of electricity in conjunction with matter in the Sun's atmosphere, we assume that the planets revolve in that portion which is at an equal distance from his poles, or what we may designate his tropics

The orbits of the Asteroids, or the space between the orbits of Mars and Jupiter, which is no less than 108 millions of miles, may be considered as the neutral ground of the electrical condition of the space of our Solar System, occupying as it does a central position between the four outer planets—Jupiter, Saturn, Uranus, and Neptune—which revolve in hot orbits, and the four inner ones—Mars, Earth, Venus, and Mercury—which occupy electrical orbits, being nearer the Sun, the amount of electricity in the orbits increasing with nearness to that luminary. Agreeably to our principles, the Sun's atmosphere decreases in positive electrical condition with increase of distance from him, till, in the most distant orbits, it must be highly negative or hot, and thus the orbit of the Asteroids may be neither positive nor negative Our atmosphere, in a negative state, holds in solution a large amount of water-vapour. We must conclude that Mercury possessed this water-vapour, but it has been evaporated together with this planet's oceans, as it now has neither water nor air

Venus is losing her ocean, we conclude, as she is enveloped in thick mists which render her invisible

What, then, becomes of the vapour and gases from a planet which, like Mercury, is being roasted and dried up by the Sun?

In Nature's processes there is no waste, and our idea is that this vapour and the gases travel back to the planets which are in process of forming in the distant orbits of our Solar System, passing through the salt-ferous orbit beyond Mars—*i e*, the orbit of Jupiter—in which we conceive our salt mines and mountains of rock salt were formed

This idea may seem far-fetched, but there is nothing impossible in it The Sun's light travels millions of miles—why should not gases do so also?

If a pan of water be evaporated the elements of the water are changed in appearance, but they are not lost, but have

passed as vapour into the air. Why should not the same thing happen in our Solar System, and the water-vapour and gases from decomposing planets like Venus and Mercury be used in the formation of water, rocks, and minerals in the planets in process of formation like Neptune, Uranus, Saturn, and Jupiter?

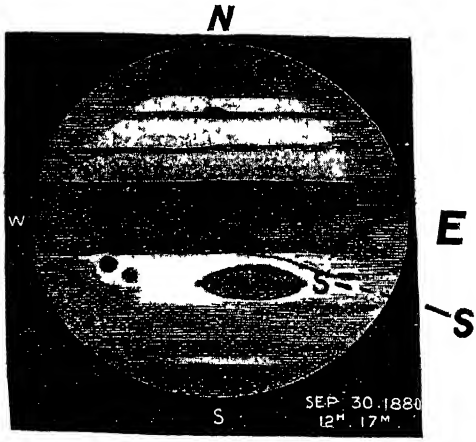
Astronomers state that there is an intimate connexion between all the planets of the Solar System, and that nothing occurs on any one of them without affecting all the others. This idea will explain why the vapour of the regions beyond the saliferous orbit of Jupiter should be saline, and, necessarily, that the ponds or pools formed by the planet's electrical state should also all be salt.

It being Saturn's bright ring that suggested to us the idea that our coal-bed formation must have taken place while Earth was in the orbit of Saturn, the saliferous or salt-bed formation we presume must have occurred in the orbit of Jupiter. Saturn at one time had but five moons, then six, and now ten, and their increase we have attributed to the using-up of the iron gas of the ring, the gas of sodium being left for disposal when required, and if in that conclusion we should be right, evidently, by the time the ring shall have been disposed of, there may be a considerable increase in the number of Saturn's moons, whilst between the coal-bed and the Saliferous there is, as we have said, the Permian, a mass of matter that must have taken time to accumulate.

Be this, however, as it may, some time about 1877 Jupiter's belts assumed a green tinge. They then became of sandy colours, as seen by different astronomers, from pink to red, and in January 1880 there appeared a great spot or mountain capped with "snow" (? salt) in addition to the belts), then the belts were in loops, with white and black spots—in fact, "Jupiter has presented during the past two seasons pictures of "rare beauty, and, if we could read them aright, of wonderful "import."

On the changes in Jupiter's atmosphere from 1880 to the present time we need not dilate, but they severally tend to confirm our conclusion that his orbit is the period of the Saliferous or Triassic formation.

FIG 4.—Jupiter, from a drawing by E E Barnard, September 30, 1880, in "English Mechanic," January 14, 1881



In the N hemisphere were seen three dark spots from the middle of August to the end of October Below these a thin reddish line, the new belt across the Equator, Satellite and its shadow, and the great red spot to the E

EARTH IN THE ORBITS OF SATURN AND JUPITER.

CHAPTER IV

Lignite—Cannel coal—Permian formation and minerals—Ripple-marked slates explained—Meteoric iron—Carbon and oxygen of the coal bed period—Creation of reptiles in Jupiter's orbit—Jurassic period its flora and fauna—What became of the oxygen atmosphere—How our atmosphere, snow, and rain were formed—Anthracite coal—Minerals and rocks formed in a state of gas—Evolution of life in the several orbits—Use of nitrogen from the decomposing atmosphere of Venus—Oolite—Wealden formations—Chalk beds

In the next orbit, that of Jupiter, we assume the presence of large quantities of carbonic acid, which Earth brought as an atmosphere from the orbit of Saturn. Between the close of the period and Earth's entrance into the orbit of the Asteroids, or between the Cretaceous and the first of the Tertiaries, there is a void Geology can in no way account for. May it not be, then, that of the formation of atmosphere? Devonshire is of the primary formation, and the vegetation of lignite evidently existed not at that period, whilst the Tertiaries frequently rest on the Primaries. This lignite, then, constitutes a very interesting epoch in our history, and should there be mines of several layers, it is highly desirable that it be clearly defined not only what is the nature of the intervening strata but also how they are disposed.

In fact, all particulars relating to the strata should be minutely investigated.

In the "Penny Cyclopædia" we are told how Professor Buckland was charmed on his inspection of a "*coal mine*" in Bohemia. "The roof is covered as with a canopy of gorgeous tapestry, &c."

But it is said in the "National Cyclopædia" that "Bohemia has large masses of granite and that lignite may be "considered fossil wood carbonised to a certain degree, but "retaining distinctly its woody texture."

If, as we have assumed, Saturn's ring denotes the extent of his atmosphere, and the atmosphere be the gases of vapour, that vapour in the orbit of Jupiter may be no longer in the gasiform condition, and as the beds of lignite, improperly called "coal mines," indicate an abundant vegetation, it may be reasonably assumed that a vast amount of water was formed at the time of the formation of the atmosphere by that vegetation, and the first of the warm-blooded animals were in every way constituted to suit themselves to the accumulation of the waters, if not to the breathing of an impure atmosphere

A greater degree of change constitutes cannel coal, in which the structure of the vegetation can only with difficulty be traced, a less change belonging to peat, so that lignite is already the intermediary, in fact, it is said, in general, lignite is most plentiful in the Tertiary strata Where, then, is it least plentiful? And as cannel coal is destitute of iron sulphide, but contains much gas, what are the geological conditions appertaining to culm or stone coal that is destitute of both gas and the iron sulphide

As we have said, of the parentage of the Permian formation, there appears to be much doubt with geologists, but in "Vestiges of the Natural History of Creation" we read "This is a most "important event in our history, for it gives us for the first "time a class of vertebrate animals capable of breathing the "atmosphere and walking upon the land", and "To them, as to "all the reptiles of this and several subsequent great periods, "belonged a fishlike form," approximating, in fact, to the fish and other forms of life of the coal measures, but whether the fish were transformed into a toad or lizard, as we are told, *capable of breathing the air*, or whether the reptiles, being actually created as a new order of beings, implies the same interposition of Providence, is a question we need not enter upon at present

If however, an eft, a toad, a frog, or a fish be put into a vessel containing water, where they are said to breathe the air, not a particle of nitrogen or other gas rises to the surface Conclusive evidence that these animals do not breathe, besides which, they are somewhat like vegetables, being cold-blooded, whereas all *breathing* animals are warm-blooded We are then told under Trias that "the univalve molluscs also indicate a "condition of the sea advancing towards that which exists near

"the present shores", that, in fact, there is an improvement in the order of Creation, an improvement or superior development being traceable throughout all the subsequent formations to the Cretaceous, when there is a complete extermination of the reptiles

The great distinction between these formations and the Primaries is their being, as it were, in lumps, and whether the materials of their several compoundings were obtained from the space through which our planet passed to the region of the Asteroids, or from the outer ring of those bodies, matters not, but as regards the water "So far as the bottom of the "carboniferous system, slabs are found marked over a great "extent of their surface with that peculiar corrugation or wrink-"ling which the receding tide leaves upon a sandy beach when 'the sea is but slightly agitated, and not only are these ripple-"marks, as they are called, found on the surface, but casts of "them appear on the undersides of the slabs lying above The "phenomena suggest the time when the sand, ultimately formed "into those stone slabs, was part of the beach of a sea of the "Carboniferous era, when left wavy by one tide, it was covered 'over with a little layer of fresh sand by the next, and so on, "precisely as in such circumstances might be expected to take "place at the present day Sandstone surfaces, ripple-marked, "present themselves throughout the subsequent formations"

In the first place, we have here evidence that these ripple-marked slabs are found no lower than the bottom of the Carboniferous period, and, furthermore, that in the Primaries there are apparently some *indications* of their being of volcanic origin, so that during the period of their being compounded, there could have been but little water, although they are said to be of deep sea formation The next fact is that sandstone never was and never could be produced *under any circumstances* from sand of disintegration, and if it could be so formed to the induration of the materials to admit of casts being formed, there should be allowed a longer period than from one tide to another There, however, stands the fact, and, as already observed, the layers are like sheets of paper laid on each other and without the presence of foreign matter, whilst all depositions from washings contain matter of several kinds, stones among the rest

Let us see whether the facts of the case may not be dove-

tailed without the slightest attempt at chiselling, the matter we have to deal with being sandstone having on one of its surfaces a certain wrinkling or ripple marks as if produced by waves, with impressions of the same on the underside of the slabs above It is an established fact that, as already stated, these ripple marks do not extend further down than the coal-bed formation, so that it may reasonably be assumed that until then there was not sufficient water to produce those marks Saturn has not only a ring round his equator, and under that ring, it may be assumed, a belt, but he has, or had, also belts towards his poles, and as we have now on Earth an ocean, and there was evidence only of shallow water where the slabs were deposited, it may be concluded that the ocean had to be formed, whilst to all things there must be a beginning

Whatever process may have produced these strange memorials of the past, certain it is that, in a stonemason's yard at Chertsey, the ripple marks on a large slab bespeak the presence of some black matter in the gaseous state, and by which gaseous matter sandstone and others appear to be, in places, actually permeated, whilst in other slabs the several layers however thin, are separated by the same black matter

The Committee appointed by the British Association to inquire into the subject of meteoric dust in the snow of a mountain, stated, in their report at the meeting of 1883, that the globules of meteoric iron in the dust they had collected must have been in the molten state, otherwise the metal could not have taken the globular form while falling, and we need scarcely state that a body to fall from a considerable height on a mountain must have been above that elevation Meteoric iron is said to be 6,000 times heavier than air, but the gas, to attain the high elevation suggested above, must be lighter than air, so that, in the conversion of the gas into the metal, there is an increase of weight of at least 6,000 times that of the gas *said to compose the iron* and such being the case with meteoric iron, it will be allowed that silica, the basis of sandstone, being much lighter than iron, in its gaseous state should readily combine with the gases of water, which are 2,000 times lighter than water, and influenced by the electrical state of the atmosphere of the planet, during condensation and progress from the Poles to the Equator might take a wave-like action

If, then, it be supposed that the slabs were carried by rota-

tion from the poles or outside the planet's tropics towards the Equator, and on reaching their destination their progress was arrested, the ripple mark would be but a necessary result Nor do we see that to the production of that action the presence of water should be necessary

It may also be observed of the fish and reptiles of the period, that the latter being of small dimensions, may have had the property of 'breathing' carbonic acid, but to assume a similar property with chlorine the gas of the Saliferous period of Trias would in all probability be more than the reader would give credit for

We have already referred to the fact that, on the atomic theory, for every 27 tons of carbon deposited in the coal-bed formation there must have been liberated 73 tons of oxygen, and every allowance being made for any of that gas that may have been contained in coal and other rocks still the volume liberated must have been enormous

On the evidence, then, of the vast formation of carbonates from the Permian to the Cretaceous periods, such as the beds of Bath, Portland, &c, we have assumed that Earth, on leaving the coal-bed orbit—*i e*, Saturn's—brought with it an atmosphere of carbonic acid, outside which was that of oxygen, the remains of that generated by the coal-bed formation and it was under that ring or atmosphere of CO_2 and oxygen that were created and lived all the reptiles of the period of the salt-bed formation in Jupiter's orbit

The continued operation of an oxygen atmosphere could not fail in reducing the temperature of the ocean and in causing the gradual deposition of the matter held in solution The Permian and the subsequent Jurassic period, the Lias, and Oolite are remarkable for their immense deposits of magnesian limestone, sandstones, and marls interstratified with clays and shales In England, these rocks stretch across from the Tees to Dorset between 4,000 and 5,000 feet thick

The vegetation of this period consisted of yews, cypresses, ferns, pines &c, but no flowering plants There could not have been much light then, our Earth being in Jupiter's orbit at such a great distance from the Sun and under a dense canopy of vapour

With these formations commenced the existence of a class of animals of the reptile or cold-blooded order which inhabited

the Earth through an immense space of time, and of which a diminutive kind exists at the present period. The presence of these animals is incontestable evidence that Earth then possessed some atmospheric conditions

The fauna, which differed clearly from those of the preceding Palæozoic and the succeeding Tertiary epochs, included corals, echinoids, sponges, ammonites, cuttlefish, and nautiloids Insects were numerous—flies, ants, cockroaches, crickets, beetles, &c Fish were approaching the modern forms

This may be called the age of reptiles, the seas were inhabited by long-necked Plesiosaurs, whose bodies ranged from 6 to 40 feet in length Of the Pterosaurs, with bat-like wings, which flew over the land, the Pterodactyl and Rhamphorhyncus are the best known But the most striking were the Dinosaurs—lizards—ranging in size from a foot to the gigantic Atlantosaurus measuring 100 feet, also frogs and toads as large as a hog of the present day Only a few mammals existed, quite small insectivorous creatures The earliest known bird has been found in Bavaria

We have now to show how the Earth's atmosphere was formed We must go back to the period of the coal-bed formation, when for every 27 tons of carbon deposited as coal 73 tons of oxygen were liberated to the atmosphere, and the question is, what became of this vast quantity of oxygen? since it is reasonable to suppose that it could not have been absorbed to the formation of the oxides of the earths, as these latter were all formed before the creation of the vegetable kingdom was begun

It is true that during the oxygen period a small portion of sulphuric and other acids were evolved and applied to the formation of salts—such as gypsum, but it is evident that the atmosphere is one source to which a large portion of this vast bulk of oxygen must be assigned, and we have assumed that the remainder of it passed from Saturn's orbit to those of the more distant planets for the formation of their rocks

To whatever section of philosophy attention be directed, a unity of purpose to the accomplishment of the Maker's object is observable throughout

If, then, the atmosphere be merely a mechanical mixture of gases, to the re-formation of the air consumed those gases should be liberated under similar conditions, or should possess

properties calculated to bring them together, but, on the contrary, nitrogen is evolved during combustion in a heated state, calculated to give it an ascending influence, whilst oxygen is given off by plants, &c, under cold or electric conditions

Nitrogen is not absorbed by moisture in any appreciable quantity, whilst oxygen is highly soluble

Nitrogen is of less specific gravity than air, oxygen of greater specific gravity

We are told that snow and rain are nothing more than congealed and condensed vapour, but snow is deposited on the tops of mountains at least a mile and a half above the point of eternal frost in the atmosphere, which point *vapour* could not pass, since at the temperature of 32° it would be frozen, and it condenses at a much higher degree.

Clouds from which rain is falling are invariably black, or of a dark colour, whilst from white clouds or "cumuli," which resemble condensed vapour, rain *never* falls Clouds are frequently jet black by reflected light, whilst condensed vapour is always white, and we are informed by Mr Green, the balloonist, that from a large cumulus, viewed opposite to the Sun, matter resembling spangles was seen to fall in showers, and this matter, when collected on the balloon or car, was solid in texture and did not dissolve

Rain- and snow-water invariably contain ammonia, which could not be collected from the air by snow in its descent, since the latter only reaches the earth when putrefaction does not take place, owing to the cold, and when, therefore, ammonia cannot be evolved from the air

Assuming, then, that gases, like all other matter, are subject to the *universal law of gravitation*, and that vapour undergoes decomposition during evaporation, there must be at the outermost bounds of the atmosphere the gases of vapour, carburetted hydrogen and nitrogen, which, of course, arrange themselves according to their relative specific gravities We should, therefore, have—

Gases of vapour	Oxygen Hydrogen	Rain	together,
Carburetted Hydrogen	Carbon Hydrogen Nitrogen	Ammonia	

rain, carbon, and ammonia would form a compound snow,

which on thawing resolves itself into water, ammonia and carbon

The water or rain, then, brings down the ammonia

Carbonic acid, which is also highly soluble, is generated by combustion, respiration, decay, and putrefaction, there is, therefore, presented to the roots of the vegetable kingdom—

Ammonia	Hydrogen	fixed by the plant
	Nitrogen	
Carbonic acid	Oxygen	form air
	Carbon	fixed by the plant
Water	Oxygen	partly fixed and evolved
	Hydrogen	as vapour

The nitrogen and oxygen combine *chemically* under the influence of the electrical condition of the plant and regenerate the air destroyed by combustion, respiration, &c

We shall now be able to show how we conceive our atmosphere was formed during the oxygen period

Of the two atmospheres—the carbonic acid and nitrogen—which prevailed during the Carboniferous period, we have shown how the former was disposed of and succeeded by an oxygen atmosphere

To oxygen we have assigned a high electrical condition, to which evaporation in the atmosphere is referable, not the mere conversion of water into vapour, as under the influence of fire, which immediately undergoes condensation by contact with the air but a separation of its gases to such an extent as shall preclude their recombination without the agency of electricity,—some such action, in fact, as that which is more fully developed in the galvanic battery and which must be in operation during the evaporation of ice.

Man can only bring into operation principles that are already in existence in Nature, therefore, there must be a decomposing influence in the atmosphere, otherwise the poles of a battery could not possess that property

Vapour is a compound of two volumes of hydrogen to one of oxygen, the respective gravities being 0 0692 and 1 1111 If, therefore, the specific gravity of these three volumes be added together and divided by three, it will give a mean for the compound gas formed by evaporation of 0 4165 or rather less than half the specific gravity of atmospheric air, and, consequently,

it possesses a high ascending influence, and as generated it would pass through the oxygen and nitrogen, and take up a position on the exterior of the atmosphere

Under different circumstances oxygen has a relative affinity for hydrogen and carbon

If a mixture be made of the vapour of carbon, hydrogen, and oxygen—such as olefiant gas and oxygen—in the proportion that the oxygen shall suffice only to convert the hydrogen into water, and the mixture be fired by the electric spark, the oxygen will combine exclusively with the hydrogen, and the whole of the carbon will be deposited A familiar illustration of this is afforded by blackening a piece of glass or a plate over a burning candle, and the same thing occurs in the deposition of soot in our chimneys

But if, on the contrary, the hydrogen and carbon be presented to the oxygen under the influence of a low electrical action—such as that which governs putrefaction and decay—the order of things is reversed the oxygen combines with the carbon, to the exclusion of the hydrogen, which enters into combination with the nitrogen and excess of carbon of the putrefying or decaying matter

Oxygen, by its influence on the masses of dead vegetable matter of that period, converted the whole of the hydrogen into a light carburet—the specific gravity of which is 0 5555—imparting to this gas a high ascending influence, and, in the upper regions, completed the ingredients requisite to the formation of snow, which as we have already explained by the formation of ammonia, brought down the nitrogen atmosphere, which, under the influence of the vegetable kingdom, by combination with the oxygen of the carbonic acid, formed by the action of the oxygen atmosphere on the dead matter, constituted through an immensity of time, the air we now consume by combustion and respiration

Air, we have already explained, is regenerated by the vegetable kingdom which absorbs the CO_2 given out by combustion and decay, and thereby it completes the chain of this important part of Nature's economy

To this action of oxygen on woody fibre we ascribe the formation of anthracite In America, cuttings have been made to a very considerable depth through some of the beds in the coalfields That this matter was not formed under the influ-

ence of "heat" is self-evident, since, if it were, other matter of a cold formation, such as carbonate of lime, would likewise show effects of the action of that agent We had, therefore, ascribed to it, as having reference to the successive atmospheres, a period ulterior to the formation of coal, the matter of which has undergone decomposition *per se* after deposition in its present position, and on the top of which it should, as a general rule, rest But in opposition to this we find that in South Wales, where our anthracite is found, the anthracite coals are not only the *lowest* beds in the formation, but there is so little distinction in point of time, that the identical same beds of coals, which are highly bituminous and flaming, on the eastern edge of the basin, are at the opposite southern extremity, two miles distant, purely anthracite.

It begins first in the lower seams, which pass gradually from bituminous to free burning—that is, flaming without bitumen—until they acquire the anthracite condition, which is merely the *abstraction of the whole of the hydrogen that originally belonged to the woody fibre*

Now the action of oxygen on the woody fibre could take place only through the medium of water, in which oxygen is highly soluble Subsequently to the deposition of the coal beds an uplifting—or, as gealogists term it, an upheaving—took place, by which vast fissures were made in the earth, through which openings, we conceive, water was conveyed to *that portion of the lower beds* which were converted into anthracite That some such process produced the effect is evident, or else why is only a portion of the same bed converted into anthracite?

We have already referred to the fact that the gases of water are two thousand times lighter than the fluid they are said to compose, and that the gas of iron is at least eight thousand times lighter than the metal Such, then, being the case, we can readily understand that all materials, when first formed or compounded in the more distant orbits, should be little else than the gas of the metal in combination with oxygen—in fact, a kind of vapour or flocculent matter These materials, then, as formed or collected by centrifugal in the journey of the planet around the Sun, formed a belt, or floating mass, around the Equator, and gradually became more dense as the planet approached the Sun, hence we can understand the very intimate combination or mixture of different materials, as in clay

slate, and of layers of different bodies intimately combined, such as in gneiss, which it is now said constitutes the primary rocks, and is of unknown but immense depth in Canada If, then, we suppose that formation to be of the orbit of Neptune, the gyratory motion implied by the motion of the "moons" of Uranus may in some way account for the admixture so different in granite, basalt, &c And if the germ of life or protoplasm of the orbit form part of or accompanied the gas, it would come into life at the appointed time under the influence of the atmosphere surrounding the planet or of the Earth belt, that atmosphere, in fact, in the absence of which the planet would be invisible, the sudden appearance of life, it is said, being one of the greatest of geological difficulties

The geologist is guided by shells, bones, and other fossil evidence of life, and these proofs of vitality sometimes extend through several generations, whilst in others they are but of short duration

Now, whatever number of seams of coal there may be in a coal measure, and in some they are very numerous, they invariably have their underclay in which, as already stated, there must have been the germ of the plants of that period Such, then, being the fact, in passing into other orbits, *by approach to the Sun*, there may have been various strata containing the germs, which germs we can understand should increase not only in numbers but also be higher in order hence we have, first, fish, then reptiles, and, finally, warm-blooded animals

Now that we begin to comprehend that electricity is in some way associated with vitality, it will be better understood why the advance should have been progressive as Earth moved on towards the Sun And when we find what very little constitutes the difference in a weakly and a strong animal, there should be no difficulty in comprehending that a highly-organised being might be produced in the soil, assuming that all the necessary conditions were present

If in this conclusion we should be right, it is evident that in the absence of the germ there would be no production

In the first of the Tertiaries lignite was produced, or at least its vegetation, which may have been of an order to generate atmosphere, which evidently should precede the creation of breathing animals

If in the orbits of Saturn and Jupiter there were atmospheres

of carbonic acid gas and of chlorine to the production of coal and salt, there can be no reason why there should not have been one of nitrogen to the formation of ammonia for the production of our atmosphere This atmosphere will be on the decrease to the evolution of nitrogen when decomposition shall be in excess of re-formation or regeneration

To the three most distant orbits we have assigned the compounding of the primary rocks terminating in the coal measures

So far as we are aware there is no evidence of any disturbance until these were completed, when it would appear the belt of our Earth underwent something like a revolution We have assumed that under the influence of a great centrifugal the crust of Earth was formed as a belt around the Equator, and, necessarily, with a decreasing rotation the several parts would have a tendency to separate to the extent of that decrease

Into the openings thus formed would flow what water may have been on the surface, and thus make provision for the next generation, the large class of reptiles of the Trias period These reptiles disappeared about the Cretaceous period, as already stated

Reverting to the orbit of Saturn, we find the Old Red Sandstone, mountain limestone on which we are told is deposited the coal, as already stated, in alternating layers with sandstone, clay, slate, &c, and intimately combined with iron sulphide, *and if the wrinkling on the slabs of sandstone were produced by water*, we have the important evidence of the condensation of the gases of water, and, consequently, of a very considerable increase in the density of the materials of the previous formations, which necessarily would contract while so condensing and form a belt at some distance from the nucleus

Of the Permian it is said "This formation, including its "underlying red conglomerates and sandstone and marls, is im- "portant, as immediately overlying the carboniferous" We are told also by the geologist of there having been a disturbance in the coal-bed formation, and by astronomy of a change of inclination to the Sun, the planet in the orbit of Saturn revolving at an angle of 26° to the Sun, whilst Jupiter has an inclination of only 3°, and in this formation—the Permian —there are conglomerates and a kind of admixture of the materials of the coal-bed period, and of the next following formation

We must remind the reader that whilst the bases of all rocks are normally white lime, clay, and sand, there are such materials as black limestone, black slates, black quartz, &c, in which the carbon is so intimately blended with the base as to leave no doubt respecting the condition of the materials when so compounded

These rocks are of the Primaries, or what Humboldt designates as transition, but in the sandstone of a later production the layers of the stone are separated by a film of black matter, indicating that the layers were formed individually before coming in contact with the gaseous black matter

We may be allowed to assume that the planet *which precedes us* (Venus) had an atmosphere similar to our own, and that by some such process as that now taking place here (the formation of nitric acid or ozone) the nitrogen of her atmosphere was set free, and that, if not retained by any influence, it was repelled to some distant orbit, we will assume beyond the Asteroids, and if between the formation of Bath stone and other forms or carbonates, there should have been periods not accounted for, the beautiful class of plants which we are told lived between the period of palms and conifers, supplied by a material containing ammonia and carbonic acid, would have fitted our atmosphere, when Earth was in that distant orbit, for the reception of the class of animals, the warm-blooded, that were to follow the large class of reptiles, which had prevailed from the period of the true coalbed

Hitherto we have had only to deal with "marine formations" —that is, pools or ponds formed on a saline surface, and which under the influence of a high centrifugal or rotation could not have been of any great depth, and according to Hugh Miller were occupied by an animal in the Carboniferous series, half fish and half reptile, in every way constituted or armed to force its way through mud, and assuming our conclusion of the formation of the oxygen atmosphere to be correct, and that it ranged itself outside that of the carbonic acid gas, and that both these atmospheres were displaced by that of chlorine, on the further progress of the planet towards the Sun, the question naturally arises how the animals of the coal-bed period, possibly under the oxygen zone, could have got transformed into the reptiles of the same zone, but further removed, the more especially, as between the two periods there

had been a great disturbance of the soil But let us proceed on our journey

In "Vestiges of Creation," p 111, we read "The highest "part of the Oolite formation presents some phenomena of an "unusual and interesting character which demand special "notice Immediately above the Upper Oolite group in Buck- "inghamshire, as well as in the vicinity of Weymouth and in "other situations, there is a thin stratum, usually called by the "workmen the dirt bed, which appears, *from incontestable* "*evidence*, to have been a soil formed like soils of the present "day, in the course of time, upon a surface which 'had pre- "viously been the bottom of the sea' The dirt bed contains "exuvia of tropical traces accumulated through time as the "forest shed its honours on the spot where it grew, and became "itself decayed Near Weymouth there is a piece of this "structure in which stumps of trees remain rooted, mostly "erect or slightly inclined, and from one to three feet high, "while trunks of the same forest, also silicified, lie embedded "on the surface of the soil in which they grew"

"Above this bed lie those which have been called the "Wealden, from their full development in the Weald of "Sussex, and these as incontestably argue that the dry land, "forming the dirt bed, had afterwards become the area of "brackish estuaries or lakes partially connected with the sea, "for the Wealden strata contain exuvia of fresh water tribes "besides those of the great Saurians and Chelonia The area "of the estuary comprehends the whole South-east province of "England" [A geologist confidently narrates the subsequent events] "Much calcareous matter was first deposited (in this "estuary), and in it were entombed myriads of shells apparently "analogous to those of the vivipara Then came a thick "envelope of sand *sometimes interstratified with mud*, and "finally muddy matter prevailed The solid surface beneath "the waters would appear to have suffered a long-continued "and gradual depression, which was gradually filled, or nearly "so, with transported matter, in the end, however, after a de- "pression of several hundred feet, the sea again entered upon "the area, not suddenly or violently, for *the Wealden rocks* "*pass gradually into the superincumbent cretaceous series*, but so "quietly that the mud containing the remains of terrestrial and "fresh water creatures was tranquilly covered up by sand re-

"plete with marine exuvia A subsequent depression of the "same area, to the depth of at least 300 fathoms, is believed "to have taken place, to admit of the deposition of the Cre- "taceous beds lying above"

"From the scattered way in which remains of the larger "terrestrial animals occur in the Wealden and the intermixture "of pebbles of the special appearance of those worn by river "action, it is also inferred that the estuary which once covered "the south-east part of England was the mouth of a river of "that far-descending class of which the Mississippi and Amazon "are examples What part of the Earth's súrface presented "the dry land through which that and other similar rivers "flowed no one can tell"

"It has been surmised that the particular one here spoken "of may have flowed from a point not nearer than the site of "the present Newfoundland—*i e*, on the lost continent of "Atlantis Hydrographic research shows that the land of the "United Kingdom extended far beyond the Western Coast of "Ireland, and has been submerged by a comparatively slight "depression, so that shallow water now covers it Beyond that "limit there is a very sudden increase in the depth of the "Atlantic Ocean Undoubtedly England was once joined to "Europe both on the North Sea side and on the English "Channel side"

EARTH IN THE ORBITS OF SATURN, JUPITER, AND THE ASTEROIDS.

CHAPTER V

Formation of fresh water, air, and salt in Jupiter's orbit—Flints how formed—Salt beds—Blackish limestone—Formation of stones by violent rotation when in a state of gas—How salt beds were preserved—Oolite and quartz, sulphate of lime, magnesium limestone, and rock salt—Iron ore—Earth's land still a belt around the Tropics when in Saturn's and Jupiter's orbits—Metamorphic rocks—Jupiter in 1853—Mammain

To the north and south of the equatorial or tropical belts of both Saturn and Jupiter there are or were certain zones or markings, which markings disappeared in the orbit of Saturn during the coal-bed period, to the subsequent formation of the ocean

If we assume that markings to the north of Jupiter indicate the region of the formation of the ocean water, which was fresh, inasmuch as it was formed when the planet had passed out of the saliferous zone, and that by solidification or accumulation the earth-belt sank to a level of the increasing water, it does not require any great stretch of imagination to understand that the water then accumulating or overflowing should be fresh, the Wealden being the first evidence of fresh water

While this was taking place, the oxygen atmosphere produced during the coal-bed formation was busy with the subsequent decaying matter, and as this subsequent vegetation of a high order was generating air, and much of the carbonic acid was disposed of to the formation of Bath and other stones and chalk, we may assume that an atmosphere of air was now replacing that of oxygen, and from whatever cause the reptiles of the Trias are wanting in the Tertiaries Before entering upon a consideration of the Tertiaries, however, we may direct attention to the fact of our chalk hills being intersected with flints in regular rows, leaving it to future generations to determine whether or not the oxygen atmosphere had any influence in producing

those alternate layers in the chalk Obviously they were not washed in, and as the flints show very strong evidence of their having been much distorted by the chalk, at the time of deposition they must have been much the softer of the two

Geologists assert that flints were sponges, which, by some operation not defined, have been converted into their present condition, but we think that the formation is purely one of aggregation In flints are found animals and other foreign matter, to which the silica is frequently little more than a slight covering, and we have in our possession a flint with a flower on its surface, more beautifully defined than if it were laid on by hand, an adhesion that never could have taken place with a sponge or any similar material

If, on the contrary, flints be merely an accumulation of silica, crystallised under the influence of the oxygen atmosphere, all their different conditions are at once explained, and it will also be equally evident why they should be deposited in the chalk formation in such straight lines, as in the cliffs of Kent, the flints having been deposited during the oxygen atmosphere and the chalk during the more extended periods of the carbonic acid atmosphere

Another fact of this period demanding consideration is the salt-bed formation, in reference to which it is said "enormous "deposits of it extend 600 miles on each side of the Carpa- "thians, and the salt mines of Wallachia, in Poland, are the "most famous in the world, and are wrought at a great depth "There is a hill of salt 500 feet high near Mount Serrat, in "Spain, and the island of Ormuz, in the Persian Gulf, is en- "tirely composed of it"

We need not dilate on the salt beds of India, America, and, in fact, on all other parts of the earth, but as illustrative of the gigantic nature of these accumulations of a *highly deliquescent material*, an extract from "First Impressions of England and Its People," by Hugh Miller, cannot be otherwise than highly interesting, affording evidence, as it does, of its being a repetition of the coal-bed formation, and which as we have stated, was of mineral origin, although not metamorphic "At Stoke Prior, about three miles to the east of "Droitwich, a shaft of 460 feet has been sunk in the Upper "New Red, and four beds of rock salt passed through, the "united thickness of which amounts to 85 feet . In the salt

"mines of Cheshire the beds are of still greater thickness, an "upper bed measuring in depth 78 feet and an underbed, to "which no bottom has yet been found, 120 feet", whilst of the salts of the sea, it is said that if precipitated and spread out equally over the land they would cover the ground one mile deep over an area of 7,000,000 square miles, and we submit for the consideration of the reader, not only whether the ocean could have been formed when this mass of matter was deposited, but also what will be the state of the ocean when the salt now on the land shall have been added to that assumed to be already in it?

The last proposition must obviously be left to the imagination, but in reference to the ocean itself it is not improbable that by capitalising the facts of the case an approximate guess may be made of the whereabouts of its formation, as will appear in Chapter VI

We are told by astronomers that not only is there attraction between the planets and the Sun, but also between the planets respectively, and this being so, we can conceive that between electro positives and negatives there should be a strong attraction, whatever may be the electrical state of the intervening space Oxygen, then, is constantly being evolved in the orbit of Saturn, whilst in the revolution of the two outside planets, Uranus and Neptune, there is a great difference, so that in their circulation around the Sun they alternately come within the influence of this oxygen, there being in the materials of the planets themselves no difference whatever

To what extent the following extract from the "Superposition of Rocks," by Humboldt (1823), will bear out our idea of coal being a mineral of nebulous formation (though of vegetable origin) we must leave to the judgment of the reader, but we are told by that philosopher (p 165) of "a *blackish* "*limestone*, passing from compact to small grained, traversed "by veins of white calcareous spar and containing so much "carbon that in some parts it blackens the fingers, and is "even found in powder in the clefts of stratification. This "accumulation of carbon, which is also observed in anthra-"citous and aluminous slates, and in lydian stone and kiesel-"schiefer, leaves no doubt respecting the question whether "the darkest limestone of Los Sevilles (near Iolumito), in "which I could find no trace of organised remains, is a real

"transition limestone" As already observed, black or darkish limestone and the other compounds could have been formed in no other way than by the admixture of their ingredients when in a state of vapour gas Whether also this *gas of carbon* coming into contact with vapour in the gasiform state, as in Saturn, constituted the wells of hydro-carbon by combining with the hydrogen and liberating the oxygen, must likewise be left for consideration Obviously, as already observed, there was no want of condensing influence by rotation and electrical condition of the planet, whether in the orbit of Uranus or of Saturn

When leaving a railway coalyard we chanced to kick a round black stone, and observing something like a circle on it we took it home for an ablution and scrubbing In this beautiful specimen there is evidence of its having been formed under the influence of a most extraordinary rotation, there being at both poles and round the middle bands both white and yellow, which throw off shoots crossing and re-crossing each other, conveying in fact the impression of globes of dark and white matter in the state of gas having intermixed while in violent rotation

That this stone is of granite formation we have no doubt, and in all probability it is composed of materials brought by Earth from Neptune's distant orbit, and compounded and deposited when in the orbit of Uranus, whose moons indicate a kind of gyratory movement for that planet

Another specimen brought from Torbay, which was rather flattened, has, if possible, the poles more clearly defined This measures 3 by 2 inches

We are told that "after the deposition of the coal-bed there "was a disturbance." This is referable probably to decrease of rotation later, which necessarily would allow the Primaries to slide out to the enlargement of the belt of land, and thus provide openings for the safe custody of the salt beds until required That these depositions of rock-salt immediately followed the Carboniferous period and were covered up by the Secondaries is beyond all question

Oolite, or Bath stone, is composed of a number of *small round* bodies, as the name defines, and we have a quarter of a *round* lump of quartz of about 6 inches in diameter, the centre of which is beautifully clear, notwithstanding the

unmistakable evidence of rotary motion, whilst the exterior is rough and opaque And of a dark specimen of the same material, the lines of stratification on the faces are far too close to be counted, but *appear* to correspond Where, however, an angle has been knocked away, the interior again affords evidence of rotation, the lines on the two connected faces, whilst corresponding to the curved lines on the interior, are at several removes on the faces In the sandhills at Farnham there are round balls of sand blended by some material One specimen in our possession is about 6 inches in diameter, and the round smooth stones of the Chertsey conglomerate are precisely the same as those on the tops of the hills and in beds, and then there are the "coalfields" and deep-seated beds of rock salt of Cheshire actually intermingled—all of which would appear to imply a nebulous formation

Since writing the above it has occurred to us that nothing has been said respecting the formation of sulphate of lime or gypsum, the base of which is calcium, the base also of the carbonates of lime that formed part of and followed the coal bed formation Sulphur, if burned in oxygen, forms sulphuric acid, but forms sulphurous acid if burned in air, and without doing any great violence to a chemical mind, it may be assumed that the gas of iron sulphide, whether as a cloud or in some other nebulous state, coming into contact with an oxygen atmosphere, might be converted into a sulphate after the oxidation of the metal, and although none of the authorities at our disposal make any reference to *native sulphate* of iron, that is no proof of its non-existence

At a period subsequent to the coal-bed formation the beds of sulphate of lime or gypsum were deposited, which is at least strong corroborative proof of the existence of an oxygen atmosphere at that time As the cooling of the waters naturally reduced their property of holding matter in solution, the more soluble salts, such as magnesia and sodium (common salt) were also deposited, the former, in combination with lime, constituting the magnesium limestone and the latter in vast beds, such as those in Cheshire, where it is found in alternating beds of red and green marl, with gypsum and rock-salt, the beds sometimes exceeding 600 feet in thickness and extending laterally from one to two miles Flints in chalk are found only in thin layers, but when the carbonic atmosphere had been,

generally speaking, disposed of by the chalk formation and limestone beds, masses of flint were deposited in layers of several feet in thickness, mountains of sand having been formed and deposited about the same time

Assuming, however, the rock-salt of the chlorine orbit to have been disposed of in some such way as we have suggested, that portion of it destined to be preserved would necessarily require a preservative, and sulphate of iron, mingling with carbonate of lime, would form gypsum and carbonate of iron, and the workable iron ore of England in the coal measures is said to be an impure carbonate, the impurity being, we presume, some other material than the clay with which it is combined All these several processes, then, together with the mountains of meteoric iron (an oxide) on primitive soil, deposited, it is presumed during the first of the coal-bed formation, will account to a considerable extent for there not being an oxygen atmosphere at the period of the close of the Cretaceous, when the reptiles disappeared

In considering the formation represented by Jupiter at some 483 millions of miles from the Sun, we shall regard our Earth-belt, produced probably during the Carboniferous period, when Earth was in Saturn's orbit, to be still a floating mass round the planet's tropics, whatever may have been Earth's diameter when in that orbit We notice that at the close of the Secondary formation (in Jupiter's orbit) there is a remarkable resemblance to the Permian strata (the close of Saturn s orbit), in both there being vast changes

That between the Cretaceous and the first of the Tertiaries, as already observed, there was an interval of time not represented by any strata

That the Tertiary deposits are, so to speak, confined to the locality of the chalk beds, and that there is a constant repetition of alternating marine and fresh-water deposits necessarily with the supposed alternate risings and sinkings of the land

That many of the animals of the Eocene, the first of the Tertiaries, were of aquatic habits, and that an herbivorous whale implies green food in close proximity to the water, in all probability not salt water, and in confirmation of this conclusion of the land and waters being on a level, the next huge animal described has a pair of tusks turning down from the lower jaw, by which it could attach itself to the shore

Beyond the orbit of the Primary planets—*i. e.*, Uranus and Neptune—must be that of the Comet, which is becoming a planet, and which comet must be a mere body of gas surrounded (as we have assumed) or attended by the materials ejected by volcanoes, such as ashes, pumice, &c Of the rotation of comets, and of Neptune, astronomers are still in the dark, but it is said of the moons of Uranus, as already pointed out, that they do not revolve as do those of Saturn and Jupiter, that in fact there is something very irregular in their motions, and that being so there may likewise be something irregular in the motion of the planet

By the geologist we are told of certain metamorphic productions in which the materials of the Primaries are disposed differently from those in the Primary rocks, and an unquestionable authority states that, "as a general rule, the meta-"morphic rocks are apt to be much contorted, not only on a "large scale, but also that the individual layers of mica, quartz, "and felspar in gneiss are bent and folded in a large number "of minute convolutions, so small that they may be counted "by the hundred in a foot or two of rock" But whilst the large convolutions of rocks unquestionably are referable to compression, these very minute ones cannot possibly be referred to the same cause, and whether the sketches taken from the specimens represent gneiss or any other of the so-called meta-morphic rocks, the stones are of original production, and, what is more, when compounded, had a rotary motion of great velocity, and leave on our mind a strong impression that if that rotary motion had been much greater the combination of the materials would have been as in granite

A sandstone from Bournemouth *close to the chalk* has its poles of rotation, whilst we have not traced any evidence of such action in the gravel of Cheitsey

It is said that the parts of these metamorphic rocks, after separation from their original matrix by disintegration, were re-united by a siliceous or quartzose cement, but where the cement was manufactured does not appear, nor are we told what is the combining agent in granite and all other rocks, *mineral* coal even not being destitute of great cohesion—a cohesion, we suspect, that was imparted to the whole of Earth's crust about the same period, and obviously after the great convolutions were formed by compression, which convolutions would not

have been possible if they had not been formed by the contraction which Earth's bulk underwent after leaving the orbit of Jupiter

In a description in 1853 of Jupiter we are told of two dark belts one to the north and the other to the south of the Equator, the remains, we assume, of the coal-bed formation to the N and S of the Equator, still in belts, and between which were deposited the Secondaries, but in which the platform system is superseded by mountains or lumps, such in fact as are at present seen in the atmosphere of Jupiter It is a fact that in the Primaries the several kinds of rocks are now interspersed in lumps, so much so that in a ten-mile radius of Birmingham may be found all the several formations for the study of geologists And as the elements of water consist electrically of extreme opposites, it may be understood that at the period when Earth was in the outer ring of the Asteroids, and for a long time afterwards, the density of the water should be greater than that of the rocks, thus the flocculent nature of the chalk will readily account for the preservation of the most delicate specimens during hardening

This Cretaceous formation is found in all parts of the world—that is, it was deposited throughout the whole length of the belt It was a purifier of the atmosphere of the remains of the carbonic acid brought from the orbit of Saturn, and, possibly, of that also from the chemical action of the deposited coal

It is said of the Cretaceous, "from a chalk bed near Maid-"stone have likewise been extracted some remains of a bird, "supposed to have been of the long-wing swimmer family," which birds, the first of breathing animals, would migrate with the air zones of oxygen and carbonic acid, so that these first traces of breathing animals, *produced from eggs*, would ultimately be on the land or confines of the water, and although we are told that the first glimpse of the highest class of the vertebrate kingdom—Mammalia—is obtained from the Stonefield slate, *an oolitic formation*, we may be pardoned, if on such questionable authority as that of only a jawbone, we should be sceptical of the animals referred to being warm-blooded, however closely their respiration may have approximated to the decomposition of air Besides which, the greater part of the Earth extended only to the Oolite, and the remains of animals,

found on that formation, but covered with diluvium, may be of much later production than that of the soil on which they were deposited

In our previous remarks on the question of Creation, as not unfrequently happens, we have created a difficulty where none should exist In the matter of the constitution of iron and the rocks, it is conclusively evident that the weight of gases composing them is absolutely nominal, electricity constituting the whole of the weight, and, if such be the case, the rule must apply with much greater force to all articles of food The young of the warm-blooded animals, when separated from the mother, by some instinct help themselves to milk, and on that material alone rapidly increase in size, whereas if the material be divested of all technical names and regarded as to the weight of its gases only, as in water, it is quite nominal If the animal be not healthy and have not in its interior a properly compounding organisation, whatever quantity or quality of food it may take, it is to very little purpose Such being the case, in the electrical soil of the Asteroids the germ should incubate, and the animal reach maturity by directly absorbing the elements of the food now obtained by secondary means

EARTH IN THE ORBITS OF JUPITER AND THE ASTEROIDS.

CHAPTER VI

Jupiter in 1913—How Davy formed water chemically—Proctor's description of ocean formation—Bulk of Earth's water formed in the outer ring of the Asteroids—Temperature of Asteroids, which revolve in two rings in a fixed orbit—Their discovery and increase in number—Purpose of the Asteroids and their animal life—How Earth acquired her Tertiaries and Mammalia

THE gases of water, as already stated, constitute only one two-thousandth of the weight of the water they are said to compose For the formation of the water, then, we must assume that the Planet had reached a position in reference to the Sun where the weight constituting agent had come into operation; and if, as already suggested, that which is gas in the atmosphere of Saturn be vapour in that of Jupiter, there can be no reason why the vapour of our ocean should not have been in our atmosphere when Earth was in Jupiter's orbit

Distance from the Sun governs the temperature of the space in the forming orbits beyond Mars, it being stated that the further removed the last four planets are from the Sun, the hotter is their temperature In "The Illustrated London News" of November 1, 1913, Mr Scriven Bolton writes "that "Jupiter is composed of a hidden semi-molten kernel which is "surrounded by opaque metallic vapours 8,000 miles in depth, "and that what we actually perceive is a seething mantle of "hot vapour poured forth from below As this mantle con-"ceals the actual surface, we witness only the outer manifesta-"tion of deep-seated convulsions, the momentous uprush of "vapour creating tempests fearful beyond human conception" So that we never see any of the actual landscape or inner core of Jupiter, but only its vaporous envelope

Uranus and Neptune must be hotter, then, than Jupiter and Saturn, and we conclude that the Primary rocks, granite, &c,

which were formed in the orbits of Uranus and Neptune bear testimony to this increase of heat, as geologists state they must have been subjected to intense heat, as shown by their crystalline structure.

On the above data even the Asteroid orbit would be too negative or hot for the ocean formation *under present conditions*, since oxygen and hydrogen for their explosion require the electrical sparks or the influence of incandescence, but Davy demonstrated that on passing mixtures of hydrogen and oxygen through tubes heated to below redness, steam appeared to be formed without any combustion "He found that by "carefully applying a heat between the boiling-point of mer- "cury, which is not sufficient for the effect, and a heat ap- "proaching to the greatest heat that can be given without "making glass luminous in darkness, the combination was "effected without any violence and without any light, and "commencing with 212 degrees, the volume of steam formed "at the point of combination appeared exactly equal to that "of the original gases"

We are yet in the dark respecting the properties of matter and of the conditions under which different bodies combine, but the above results of one of England's greatest philosophers remove all difficulty in comprehending that in a moderately hot orbit, such as that just beyond the Asteroids or of the outer ring of those bodies, the gases of vapour or compounds of snow might combine *to the formation of water* and ammonia, besides which, the formation of the ocean was not apparently unattended with washings and other such effects on the then surface of the Earth, or what are termed denudations, and the first evidence of fresh water was, as we have stated, the Wealden.

The following extract from Proctor's "Poetry of Astronomy" confirms our views of the formation of the waters of Earth:—

"When our Earth was intensely hot, it was surrounded by "volumes of vaporous clouds some hundreds of miles from "her real surface—like Jupiter and Saturn to-day"

"A planet, during its extreme youth, like Jupiter, has its "oceans floating in the form of cloud masses and cloud layers "in a very deep atmosphere"

"The Earth's whole frame was intensely heated"

"Above this hot surface was the fiery atmosphere of that "primeval time, enormously deep, complex in construction, "bearing enormous masses of aqueous vapour and every form of "cloud layer, swept by mighty hurricanes, whose breath was "flame drenched with showers so heavy that they might be "called floods, and tortured by the uprush of the vaporous "masses formed as these floods fell hissing on the Earth's fiery "surface"

"After myriads of centuries came the time when the sur- "face so far cooled as no longer to glow with ruddy light, and "no longer to reject by vaporising the waters which fell upon "it Then a fearful darkness prevailed beneath the still mighty "canopy of cloud, for only little by little, by very slow degrees, "would the water descend upon the Earth's surface"

Of the wrinkling of the sandstone of the coal-bed formation having been produced by water in Saturn's orbit we have ventured on expressing a doubt, and in that doubt we are sustained by the fact that in the next orbit, that of Jupiter, there were deposited vast masses of salt—a highly soluble material, but that operation having been completed there does not appear to be any reason why the formation of the ocean should not have taken place, and about the close of this part of our history there was the Wealden, followed by the Cretaceous, terminating, as already observed, in a long pause, unaccounted for by Geology, so that we may reasonably assume that both the atmosphere and fresh water formations were completed in this period That is, they took place in the first half or outer ring of the Asteroids, and for which downpour of rain the animals of that period were evidently admirably constituted—first aquatic, then of the woods, and provided with a double garment

The reader may remember that the Sun, being highly incandescent, is surrounded by an intensely electric atmosphere, the amount of electricity in the ether of space diminishing gradually in proportion to the distance from him We know that in Earth's orbit the upper regions are intensely cold, due to the great amount of electricity in the Sun's atmosphere In the orbits of the planets further removed from the Sun there would not be so much electricity, with a consequent increase in the heat of the orbit

When Earth was in the orbit of Jupiter she was a highly-

heated mass—like that planet is now—surrounded by dense vapours, which shut out the far-distant Sun When, after thousands of years the formation of our air and water was completed, the vapours having been cleared away by these two processes, the reign of Solar light and heat began, and conditions like those now prevailing gradually emerged, the Earth contracting and decreasing enormously in bulk as she travelled onwards into and through the cooler Asteroid orbit

The denizens of Earth changed in form and habits with the change of orbit, the immense reptiles of the Jurassic period gradually dying out and being replaced by mammalia, which in the Eocene period were small, but they increased in number and size, till, in later Tertiary times, we find large animals such as the rhinoceros, mammoths, &c, and in the Pleistocene epoch the Elephas Antiquus, or straight-tusked elephant, standing 15 feet high, whose tusks measured 16 feet in length It is said that men of the Stone Age were contemporaries of this giant

The orbits of Neptune, Uranus, Saturn, and Jupiter being very hot, and those of Venus and Mercury highly electrical, there must, then, as already stated, be a point where the *extremes* meet or became neutral, and we find that the figures

0, 1, 2, 3, 4, 5, 6, 7, 8, 9

represent the Sun and the planets now known to be revolving around him, 5 being the orbit of the Asteroids, with four planets on each side, and if the central orbit be neutral the bodies within that space must be in the same condition, more especially those in its centre, the Asteroids having a warm equable temperature

And if there be no large planet in the Asteroid orbit, that is no proof that the principle which governs the rotation of planets is wanting in that orbit, or is not influencing all the bodies in it, a few only being of telescopic magnitude and many of them being too small to form a globular shape Several are known to be quite irregular-shaped masses—Eros for instance—which appears to be almost triangular, *like a mountain floating in space.*

But of the rotation of the Asteroids there is no information, the largest being from 80 to 250 miles in diameter, but their distances from the Sun appear to be pretty well defined

Taking for our guide the "Elements de notre systéme

planetaire" in M Pouillet's work of 1853, in the mean distance from the Sun, Earth being 1 00, that of Mars is 1 52, and that of Flora, the nearest of the Asteroids at that date, is 2 20, and that of Hygie, the farthest, is 3 18, so that the mean distance between Mars and the first of the Asteroids is 68 and that between the two Asteroids 98, or half as much again, and as the mean between Jupiter (5 20) and Mars (1 52) is 3 68, one-fourth of that immense space (or more than 188 millions of miles) was already occupied by the fifteen Asteroids discovered to 1853, a space that no doubt will greatly increase with the increase in the number of these bodies

Assuming, then, the conditions which for the time keep the "moons" within certain distances from the planets, around which they revolve, to be subject to those of the orbit and of the planet and moons (which conditions, both in orbit and planet, are constantly undergoing a change), as gradually as a planet enters the orbit of the Asteroids those conditions must diminish in the relative cubes if not densities, and there will be no greater attraction or repulsion between the planet and its moons, supposing any moons to remain, than between it and the Asteroids And if the Asteroids be not subject to the conditions that gradually draw the planets towards the Sun, but are confined to their respective fixed orbits in the planet's onward journey, it must come in contact with those bodies, annex them, and clear out the orbit Evidently every Asteroid has its individual orbit, otherwise they could not be enumerated, but that does not prevent there being two rings of these little planets

That all the planets were once gas is an accepted axiom, and Jupiter, with his enormous centrifugal, can be little more than a bubble Such being the case, as he enters the neutral orbits and approaches that of Mars, he may as gradually lose that rapid rotation, with a proportional loss of volume from decrease of heat in the orbit

Of the history of the Asteroids, the four first discoveries date no further back than 1801, 1802, 1804, and 1807, from which time no discoveries were made till 1845 to 1851, when eleven more were added to the list, being in all fifteen, the number now in 1915 being over 800 They are said to consist of two rings divided by a considerable space

Herschel died in 1822, and during his lifetime discovered

not only Uranus but also the "*Moons*" revolving around that planet It would, therefore, appear all but impossible that had the present host of Asteroids existed during his days none of them should have crossed the field of view of his telescope and that of those of the other astronomers, who for many years must have been constantly exploring the more distant orbits, even if search were not made for a planet in the Asteroid orbit, astronomers having determined long before 1800 that there should be one there, but it is now shown by later research that it is the disturbing action of Jupiter and his satellites that has prevented the formation of a large planet in that orbit

It is conclusively evident that had there been a planet it would have dominated the smaller bodies As it is, however, these bodies have independent motion within their respective orbits, and if the word "planetoid" be a correct name for them, they may respectively perform the operation or offices of planets, and retain within themselves not only the germ but also the animal or plant that germ was destined to produce And if the first discovered of those bodies be those nearest to the Sun, they will obviously be the last appropriated by the approaching planet, and evidently will have had a much longer time allotted to them to attain maturity, before being annexed by the planet, than those at a greater distance or of more recent formation

Those bodies, it may be urged, are of considerable size, and their combined mass now might represent more than that of Earth, but if, as we suspect, they be but gas or vapour, when drawn to and consolidated on the belt of the planet, each of them not exceeding 250 miles in diameter would constitute but a very small bulk compared to the enormous mass of matter composing even an ordinary sandhill

Without there being any other geological cause than a probable change of soil and orbit the pachydermata of the preceding era now disappear, but others enter upon the scene, and these, it will be seen, have not the aquatic habits of their predecessors, but, on the contrary, bespeak the existence of woods.

Geologists cannot account for the fact that animals—elephants, &c—that now only occupy the Tropics lived then not only on land now in temperate latitudes but also actually in what are now the Arctic regions' But at that distance from

the Sun the atmosphere must have been of a hothouse temperature Also, when in the outer ring of the Asteroids, Earth's angle of inclination was only 2°, so that the temperature was the same in each zone all the year round And we must also remember that when Earth was in this outer ring there was no land in her north or south, as it was still a broad belt around her Tropics

We assume that the purpose for which these planetoids are created is to supply the planet which enters their orbit with plants, animals, and Tertiaries In the outer ring of the Asteroids, which the planet would enter upon first, it would receive the first Tertiaries, with the germ of the animals and plants belonging to that geological period, and at this time "all the principal mammalian forms, except the highest and "a few others, now existed" The highest we assume to mean man and those animals with which he is now associated and which are necessary to his existence in a state of civilisation and altered atmospheric conditions Of the two assumed rings of the Asteroids, as already observed, the outer one would be gathered up first by Earth when, on her spiral progress towards the Sun, she left the orbit of Jupiter and entered that of the Asteroids, round which she travelled thousands or millions of times through the regions occupied by these little bodies, which were probably very numerous then, and as she met them they would fall lightly upon her surface as a gaseous cloud, burying where they fell what was then on the surface of the land, including prehistoric man and those animals whose bones we now find when excavating beneath the surface of our Earth

Where did Earth get her Tertiaries if not from the Asteroids? whose orbit, the neutral one of our Solar System, we may all look upon as that of the creation of man

The last Asteroids to be annexed by Earth would be those of the inner ring, which are the nearest to the orbit of Mars

Thus, when our Earth left the Asteroid orbit she had cleared it out, Mars, no doubt, did the same after many thousands of years, when Jupiter will in his turn enter that orbit, the planetoids will be ready for him in great numbers

The orbits of Neptune, Uranus, Saturn, and Jupier were the forming periods of Earth, and whether the animal kingdom followed in regular succession by transmutation, or new orders of beings came into existence by progression or crea-

tion as the soil and atmosphere were suited to their development, is a question to the solution of which facts are wanting, and without more knowledge of the nature of the Asteroids, to hazard a decided opinion on the purpose they or their orbits fulfil in this stupendous and beautifully harmonious work, would be beyond the bounds of this inquiry, founded as it is on well-authenticated facts, but facts unquestionably demonstrate that in the creation of the mammals there must have been conditions very different from those hitherto assigned to it, and which conditions justify a little speculation on the manner in which they were brought about

But one fact is certain—*i e*, that a gigantic race of reptiles, the link between the vegetable and animal kingdoms, which must have been created in a warm orbit beyond the Asteroids, probably Jupiter's, immediately preceded the gigantic mammals.

In the oviparous cold-blooded *non-breathing* tribe that prevailed before the warm-blooded or breathing animals, large numbers came into existence at once, and those animals are no sooner released from the egg than they have the power of rapid action—can provide for themselves and can exist for a long time without food, conditions that enable them when young to preserve themselves from utter destruction Not so with mammals, who require a constant supply of food and the support and protection of the parent until maturity

When, then, man and other defenceless animals entered on the stage, when Earth was revolving in the inner ring of the Asteroids, either conditions that now prevail could not have been dominant, or there must have been a gradual transformation from the cold-blooded race to the warm-blooded, whilst it would not be consonant with the wisdom of *the Creator's* provisions to suppose that such an enormous space of the Solar System as that of the Asteroids should be destined only to occupation by a number of bodies of no consideration within themselves

EARTH IN THE OUTER RING OF THE ASTEROIDS.

CHAPTER VII

In the early orbits, Earth's land was all flat and soft—How arranged—Earth possessed vegetation and atmosphere—Her land still a broad band around the Equator—Explanations and diagram showing how the continents fitted into each other—The Asteroids, space and rings—Earth's change of the angle from 2′ to 28′ took place in the orbit of the Asteroids—The effects of that change—Mammoths preserved in ice and Earth's land sent to the north—Extracts from "Humboldt on the Rocks", from "The Illustrated London News," by W P Pycroft, from Mr Clement L Wragge's article in "The English Mechanic", from Sir Henry Ray Lankester, in "Science from an Easy Chair", and from Mr Allen S Walker's lecture, "Effects of the Change of Angle in England"—Earth's first mountains

In all the foregoing extracts, and in all the geological works that have come under our notice, reference is made to the deposition of matter in basins, but we need scarcely state that the rapid revolution of centrifugal of the planet, when in the early orbits, must have made all surfaces level or nearly so, and that the basins were formed by depression from superincumbent matter and contraction of Earth's bulk

As we have stated, there must have been ponds of a kind of mud *produced by the pressure of the water*, in which the first of creation waddled, but there could not have been any depth of depression

There were then the platforms to the coal-beds, constituting by far the greatest part of Earth's crust, then the Secondaries, occupying probably a space of much less width than the platform belt, and on these again the Tertiaries, deposited upon Earth wholly from the Asteroids, which were unknown up to the year 1800

Under an enormous centrifugal, such as that of Saturn and Jupiter, all the Earth belt underneath the "ring" and "equatorial belt" must be floating, in whatever way the contributions from above may be poured or drawn upon it, and as all matter in space under rotation is globular, the contributions must have taken a similar form, although being soft and under a high

FIG 5

Probable position of Earth's land when in one mass around the Equator

revolution would naturally spread out or flatten under the influence of the belt, to the formation of layers, whilst with decreasing rotation and lessening negative condition they would partake more of the solid form, although still of a soft or pulpy nature

As the planets are all floating in space, there can be no reason why Earth's belt of land should not have floated until the period when gravitation began to make itself felt

During the period of the deposition on Earth of the Carbonates, when in Saturn's orbit, there were, of course, periods when the conditions were calculated to produce vegetation, but it is evident that those productions were local, and it may reasonably be assumed that during Earth's transit of many millions of miles, while travelling through the orbit of Jupiter into that of the Asteroids, vegetation had sufficiently progressed towards the present state of things to admit of the formation of our atmosphere

We have already observed that the Secondaries were deposited on or between the Primaries when these had undergone a great disturbance after the coal-bed formation

When Earth left the orbit of Jupiter and her speed of rotation decreased, her belt of land being still a floating mass, the Primaries floated or spread out both northwards and southwards, thus widening the mass of land which was still a broad band around the Equator, by which we mean that to its restoration on a globe or map of the world on a globular projection, the North Polar land and North America must be brought down to the Tropics and the N W corner of South America being placed to fill up the Gulf of Mexico, the Rocky and Andes Mountains will be re-united, though there were no mountains at this period of Earth's history The West of Africa was joined to the East of South America, and a casual glance at the map will show that the *bends and curves of these two continents correspond*, the Gulf of Guinea being attached to the north east corner of South America where is Cap St Roque

Travelling northwards, the West of Africa filled up the bay formed by South and North America up to Nova Scotia, an allowance, of course, being made for such parts of the depressed land of the Gulf of Mexico that have remained below the water and the trees from which are occasionally washed to the shore The North of Africa was joined to the South of

Europe, the West of which joined the East of North America, Asia being on the East of Europe

The West of Australia was probably joined to Africa, extending from Mozambique to Cape Gardafui, which would unite with Cape Londonderry on the N W of Australia, and the North of Australia formed part of the South of Asia

In Europe, if we obliterated the Bristol Channel, which did not then exist, the North of Cornwall would join the South of Wales, and these coasts correspond, notwithstanding "denudation" by Atlantic waves Ireland fitted into England and Scotland, the South of England joined the North of France, so that the Lizard met Cape Finisterre, whilst Spain was turned up so that her north coast filled up the Bay of Biscay on the West of France, Cape Ortegal of Spain, Cape Finisterre of France, and the Lizard of England all being attached to each other

In those days the North Sea did not exist, and the land of Great Britain extended to Scandinavia

The accompanying sketch (Fig 5) will illustrate how the land was disposed around Earth's equator when she entered the Asteroid orbit, and, incidentally, we may remark that this position of the land will explain why tropical products such as coal and the remains of tropical flora and fauna are now found in our Arctic and Antarctic regions

Earth's entry into the Asteroid orbit brought about the almost entire destruction of the earlier forms of animal life, which were succeeded by mammalia, which advanced progressively towards a higher organisation until an intelligent being —Man—was evolved, who should ultimately be able to study the law under which he was created

Great geological changes also took place during the Tertiary period, there being as much difference between the Eocene and the Pleistocene as there is between the Eocene and the Secondaries

The climate during the Eocene and Miocene periods to nearly the close of the Pliocene was warm and equable, but towards the close of the latter period arctic conditions prevailed

We assume that the planets which are further removed from the Sun than Earth show us what our past history has been, and, therefore, as Neptune, Uranus, Saturn, and Jupiter all

have different axial tilts, we conclude that Earth had several changes in her angle of inclination during her progress through those early orbits, and that when she entered the Asteroid orbit her angle of inclination was only 2°, the same as Jupiter to-day, which angle she retained during part of the time in which she revolved in the outer ring of the Asteroids, when warm-blooded animals, mammoths, &c, roamed over the land, which at this period was still a broad band extending N. and S around the Equator

Then we conclude that a tremendous convulsion occurred which destroyed most of the life which was then on Earth, which convulsion, we assume, was caused by the sudden change from Earth's angle of inclination from 2° to 28°, or perhaps much more, and that sudden change jerked the whole mass of land northwards, the North Polar land, Europe, Asia, North America, to which South America and Africa were attached, all being carried up to the North Pole and North Temperate regions, whilst as a result of this sudden jerk the waters which Earth then possessed rose up in a huge wave, swamping the land and being more mobile than the earth, swept over it northwards, carrying in its mighty rush crowds of thousands of mammoths and other animals which were buried in the soft mud and frozen in, in the North of Siberia, in East Siberia, and in Mackenzie land and on the North American Polar shores, where they are now dug out, some with their flesh still in a state of perfect preservation

The north coasts of North America, Europe, and the N E of Asia are very much broken, showing that these continents bore the brunt of the rush northwards when the sudden change of Earth's angle of inclination took place, whereas South America and Africa, being then still joined to North America and Europe, travelled northwards, sheltered by those continents, their coasts as a result being much less indented and broken

If the effects of this catastrophe were such as to violently disturb the soil, any loose matter on its surface would undergo a much greater amount of disturbance than the soil itself, and assuming the antediluvians to have existed at the time of the early Tertiaries—that is, before the Post Pliocene (which Earth acquired later in the inner ring of the Asteroids)—there must have been a large accumulation of their bones and tusks at the close of the period The following descriptions will

further convey some idea of that accumulation and the sudden manner in which the animals were destroyed —

"PRESERVED IN ICE.—About 40 000 lbs of fossil ivory— "that is to say, the tusks of at least 100 mammoths—are "bartered for every year in New Siberia As many as ten tusks 'have been found lying together in the 'Tundra,' weighing from '150 lbs to 300 lbs each

"Notwithstanding the enormous amount already carried "away, the stores of fossil ivory do not appear to diminish "In many places near the mouths of the great rivers flowing "into the Arctic Ocean, the bones and tusks of these ante- "diluvian pachyderms lie scattered about like the relics of a "ploughed-up battlefield Entire mammoths have occasion- "ally been discovered, not only with the skin, *which was pro- "tected with a double covering of hair and wool entire*, but with "fleshy portions of the body in such a state of preservation "that they have afforded food to dogs and wild beasts The "mammoths appear to have been suddenly enveloped in ice or "to have sunk into mud which was on the point of congealing, "which, *before the process of decay could commence*, froze around "the bodies and preserved them in the condition in which they "perished It is thus that they are occasionally found when "a landslip occurs in the frozen soil of the Siberian coast, "which never thaws even during the greatest heat of summer "to a depth of more than two feet"

As already remarked, what is stated to be the Tertiary epoch has been founded on the evidence of remains, the greater part of which have been obtained from the plaster of Paris *accumulation*, which is, we are told, the result of a repetition of fresh and salt water strata, and in "the more recent accumulations "of *Drift* on the Thames *below London* they are also found", whilst the line of the drift was apparently across the Norfolk, Suffolk, and Essex flats, the N W corner of Kent, Sussex, and Seine, all which land was then united

What may be "the principal mammalian forms and a few "others" that are absent in the Pliocene deposits we cannot state, but according to Hedembrim, a Siberian official, the only educated person who has examined the New Siberian Islands during summer, "there are numerous hills in the interior covered "with the remains of not only mammoths, &c. (thick skins),

"but also of sheep" Then he further states that 'on account "of their inaccessibility these regions have never yet been "scientifically investigated, although the regular resort of ivory "collectors who visit them every spring in dog sledges and re-"turn to the Continent on the autumn ice being formed, laden "with a rich harvest'

If, then, ivory collectors can do this, it does seem rather unaccountable that such a store of scientific lore should have been so long unexplored!

In reference to these vast Polar accumulations of mud, bones, and tusks, Dr Ure, in the "Outlines of Geology,' in his "Dictionary of Chemistry," guided by geological doctrines, states "These irruptions and retreats of the sea have been "neither slow nor gradual Most of the cataştrophes which "have occasioned them have been sudden, and this is easily "proved, especially with regard to the last of them, or the "Mosaic deluge, the traces of which are very conspicuous In "the Northern regions it has left the carcases of some large "quadrupeds which the ice has arrested, and which are pre-"served even to the present day entire That if they had not "been frozen as soon as killed they must have been quickly "decomposed by putrefaction But this perpetual frost could "not have taken possession of the regions which these animals "inhabited except by the same cause which destroyed them, "the cause must, therefore, have been as sudden as its effects "The two most remarkable phenomena of this kind, and which "must for ever banish the idea of a slow and gradual revolu-"tion, are the rhinoceros, discovered in 1771, and the elephant, "recently found by Mr Adams near the mouth of the Lena "This last retained its flesh and skin, on which was hair of "two kinds one short, fine and crisped, 'resembling wool,' and "the other like bristles Every part of the globe bears the im-"press of these great and terrible events so distinctly that they "must be visible to all who are qualified to read their history "in the remains which they have left behind"

"The Grave of Nature," by D Gath Whitley (from "Chambers' Journal," Part 62) —

'The term 'Grave of Nature,' which we have applied to "N E Siberia, is found to be still more appropriate when we "consider that the whole of this region is one vast graveyard,

"filled with the bones of animals which have perished within
"comparatively recent times Little does the traveller think,
"as he drives in his reindeer sledge over the dreary wastes of
"snow, and sees no living thing save the Arctic fox, the raven,
"and the snowy owl, that the ground below him, only a few
"feet beneath his sledge, is packed full of the bones of enor-
'mous animals which perished in some mysterious manner since
"man appeared upon the earth

"Such, nevertheless, is the extraordinary fact The whole
"of Northern Siberia, from the Ural Mountains to Behring
'Strait, is one vast graveyard filled with animal remains The
'bones, teeth, and skulls are those of elephants, rhinoceroses,
"buffaloes, and musk-oxen These bones occur everywhere
'They are found on the banks of the rivers, in the plains, on
"rising ground, and in frozen cliffs

"On the shores of the Arctic Ocean there are sloping banks
"of ice These are split and furrowed in all directions with
"deep chasms, and as the traveller looks from above into their
'dark depths, he sees that the lower portions of these chasms
"are filled with the tusks, bones, and skulls of elephants and
'rhinoceroses in countless abundance!

"In other places on the Northern Coast of Siberia fronting
"the Arctic Ocean, the low cliffs, which rise above the beach,
'and are formed of earth and clay, are full of the bones of
"these animals In the brief summer, which hardly lasts six
"weeks, portions of these earthy cliffs thaw and fall on the
"beach below Then it is that the traveller who walks along
'the shore witnesses an astonishing spectacle Not only does
"he observe icebergs stranded on the beach, but he also sees
"the tusks, bones and teeth of mammoths lying on the shore,
"and whitening the beach for long distances!

"If he leaves the Arctic Ocean behind and journeys inland,
"the same sights constantly meet his astonished gaze He
"comes, it may be, to a plain, where for perhaps half a mile
'the whole ground seems to be formed of masses of tusks,
"teeth, and bones of elephants and rhinoceroses welded together
"in one confused mass in the frozen soil These mighty beasts
"must have been destroyed in herds, but how they perished no
"one knows

'Still more amazing is the fact that the islands in the
"Arctic Ocean north of Siberia are equally full of the tusks

"and bones of elephants and rhinoceroses, and on the shores "of these islands in the Polar Sea the tusks of elephants can "be seen sticking up like trunks of trees in the frozen sand! "Stranger still, actually the very bodies of these great elephants, "with flesh, fur, and hair perfect, are seen standing upright in "the frozen cliffs When the cliffs thaw, the bodies of these "great elephants fall to the ground, and are so perfect, after "being entombed for thousands of years, that the wolves eat "the flesh!"

In some of the cases referred to, the animals are embedded in a vast accumulation of earth, but of what depth has yet to be determined, and as the cause of the sudden catastrophe was a change of inclination of our planet there must be other accumulations of a similar nature in other parts of the land then constituting the North It is stated by Dr Grenfell, in "Tor'ers of the Deep," that mammoths, specimens of whose tusks he possesses, have also been dug out of the soil of the Northern Mackenzie district along the North American Polar shores Their skeletons (not whole carcases) have also been dug out in Central Europe, in Kent, in the valley of the Thames, &c, showing that these animals existed in many parts of the world

The following extract from "Mountains and Forests of South America," by Paul Fountain, pp 143 and 5, also shows that the extermination of animals was not limited to the north of the world —

"In Brazil, in some large limestone caverns, there were "many petrified animal remains one was a species of guanaco, "of much larger size than any now living, and there were many "petrified bones which seemed to have belonged to gigantic "jaguars and deer The bones of the tapers showed that "they had belonged to a species half as large again as those 'of the living kind'

"In both caves there was such an astonishing number of 'remains of animals so diverse in genera and species that I 'am quite satisfied that this remarkable collection of animals "did not come together in the caverns in the ordinary course "of their existence They must have all perished together at "the same time, and, if they entered the caverns in a living "state, must have rushed there under the impulse of frantic

"fear Everything connected with their presence and 'attitudes in this place points to the carcases having been "washed here by water, and I do not doubt that these bones "are many thousands of years old"

'There is clear evidence that the former brute inhabitants "of the world perished suddenly in some great and unaccount-"able calamity of a universal character"

At p 201 'I have seen in the Ecuador Andes, and in "many other places in the American Continent, that there are "incontrovertible evidences of terrific convulsions, which must "not only have been sudden and of indescribable force, but "of a very great extent, involving thousands of square miles of "territory"

We also refer to "Humboldt on the Rocks" of the parallel-ism of strata or beds as bearing testimony to the manner in which Earth's belt of land was broken up

'Since the year 1792 I have been attentive to this parallel-"ism, or rather to this *loxodromism* of beds Residing on "mountains of stratified rocks, where the phenomenon is con-"stant, examining the direction and dip of primitive and trans-"ition beds, from the coast of Genoa across the plain of the "Rochetta, the plains of Lombardy, the Alps of St Gothard, "the table-land of Swabia, the mountains of Baireuth, and the "plains of Northern Germany, I have been struck, if not with "the constancy, at least with the extreme frequency of the "direction N 45° E of the compass of Freiberg (from the 'South-West to the North-East) This inquiry, which I "thought would lead naturalists to the discovery of a great law "of Nature, at that time interested me so much that it became 'one of the principal reasons for my voyage to the Equator "When I arrived on the coast of Venezuela and passed over "the lofty littoral chain and the mountains of granite-gneiss "that stretch from the Lower Orinoco, the basin of the Rio "Negro and the Amazon, I recognised again the most surprising "parallelism in the direction of the beds, that direction was "still N 25° E, perhaps because the littoral chain of "Venezuela is not far from the angle which the central chain "of Europe forms with the meridian"

'There does not exist in either hemisphere a general and "absolute uniformity of direction in the rocks, but in regions

"of considerable extent, sometimes on several square leagues, "we perceive that the direction—more rarely the dip—have "been determined by a system of particular forces There is "observed at very great distances *a parallelism of beds*, a direc- "tion of which the type is manifested amidst partial disturb- "ances and which often remains the same in the primitive and "transition formations This uniformity in the parallelism of "beds was observed in a great part of North Germany, at the "Fichtelgebirge, in Franconia, and on the banks of the Rhine, "in Belgium, the Ardennes and the Vosges, in the Cotentin "and the E Tarantaise, in the greater part of the Alps of "Switzerland and in Scotland"

This parallelism of strata evidently points to conditions that are in no way terrestrial, and we are told that "as we are "ignorant of the primary causes of phenomena, natural philo- "sophy, of which geognosy will one day form one of the most "interesting parts, ought to stop at the knowledge of laws, "and in the phenomena with which we are occupied, those laws "may be subjected to precise measures"

'It must not be forgotten that the lines of the direction "of beds meet at meridians, when at great distances those "beds are, for instance, uniformly directed N 45° E, like the "elements of a loxodromic line without being parallel in "space The direction of ancient (primitive and transition) "beds is not a trifling phenomenon of locality, but, on "the contrary, a phenomenon independent of the direction "of secondary chains, their branchings, and the sinuosity of "their valleys, a phenomenon of which the cause has acted at 'immense distances in a uniform manner—for instance, in the "ancient continent, between the 45° and 57° of latitude from "Scotland as far as the confines of Asia What is that apparent "influence of the high Alpine chains on beds which are some- "times more than a hundred leagues distant? I can scarcely "believe that the same catastrophe heaved up the mountains 'and the strata in the plains so that the bent edge of those "strata, formerly horizontal, now all inclines from 50° to 60°, "and forming the surface of the globe, should be found at "great depths *Have the chains of the Alpine mountains been "heaved up?*"

Between the confines of Asia and those of Europe are the

Ural Mountains, and on the other side of that chain, to the east of Asia, there is also parallelism in the beds, but of a contrary direction, produced no doubt by the break-up of the Earth belt in its centre on the change of our planet's inclination from that of the orbit of Jupiter to that of Mars, and by which change of inclination all the matter on the surface of Asia was carried by the surface water to the North, constituting the present coast and New Siberia North America and Europe also, by their broken-up North coasts would appear to have been much disturbed

The Ural Mountains clearly define the point of breakage of the belt of land in so far as Europe and Asia are concerned, and the accumulation of the bones of the pre-historics of Asia terminates at the Gulf of Obi, that being possibly the termination of the tableland of Asia or unbroken surface which allowed of all matter on the surface being carried away bodily in one direction

Confirmation of the truth of our idea that Africa and South America were once joined is afforded by the following extract from "The Illustrated London News" of August 8, 1914, in which Mr W P Pycraft gives an account of the fossil remains of the Arsinoitherium, a unique type of animal remarkable for the great size of the horns and the curious shape of the ribs At the close of the extract he says "How vast are "the changes which the west of the Nile Valley has undergone "may be gathered from the fact that, besides the primitive "whales, remains of sharks and rays have been found there "When the sea retreated, dense, well-watered forests came into "being, forming the nursery for hosts of animals long since "extinct, or represented to-day by descendants transformed, "some into giants, some into dwarfs, as the 'Struggle for Exist-"ence' determined From the evidence of its fossils, it seems "clear that *before the continent of Africa took its final shape, "it was more or less directly connected with the now distant "continent of South America* But that is another story It "is a fact, however, to be borne in mind in the present con-"nection, since it serves to remind us of the vast measure of "time which has gone to the making of the world as we know "it to-day These fossils show us that what is now a burn-"ing desert was once a steaming forest, and before this was "the hunting ground of sharks! The days of arsinoitherium

"date somewhere about the middle of these tremendous hap-
"penings"

The following extract from Mr Clement L Wragge's interesting article in the "English Mechanic" of July 17, 1914, bears on the same subject —

"Axial tilt is responsible for the vast floods which once
"swept the Blue Mountains of Australia, where are now to be
"found vast layers of vegetable *débris* in the fossil state, and
"it is also responsible for the wonderful physiography of Terra
"del Fuego and the South-Western corner of South America"

"Australia, Tasmania, Antarctic lands, and South America
"*were once all linked up*, and members of present-day expedi-
"tions are proving very slowly what has been known to the
"few The mantle is falling from their eyes, and they are at
"last beginning to see, take notice, and understand"

Also Sir Ray Lankester, in "Science from an Easy-Chair," says in reference to the Pleistocene period "The British Isles,
"in this olden time, were part of the Continent of Europe"

And Mr Allen S Walker, lecturing on March 1, 1915, at the Y M C A Headquarters, Tottenham Court Road, produced a piece of flint said to be of the period of 120,000 years B C, and explained that it was an instrument of the chase or of offence or defence in days when Britain *was part of the mainland of Europe* and there was no North Sea

In reference to the land of our Earth having been in a belt around the Equator, it might seem that there would not be enough of it to go right round the circumference, but the reader must remember that the land now at the North and South Poles also then formed part of that belt, as well as a continent, which probably was where the Pacific Ocean now is Part of this continent went to form our moon during the volcanic era, which will be explained in Chapter XII

Geology is essentially a science of facts, and because in sundry parts of Europe the remains of ancient volcanoes are found intermixed with tertiary strata, "lacustrine as well as
"marine," it is naturally inferred that the volcanic action was at the period of the deposition of those strata, but at this period of our history we are far removed from that of volcanic action, which must have been about the time of the formation

of the Alps, Pyrenees, and Ural Mountains, which took place later in the orbit of Mars, not that they were of volcanic origin or any other subterranean movement, but they were produced by the same influence, and to close this part of the subject we will call attention to swells that disturbed the superficies of the Tertiaries of England

The fact of the matter, then, is that the London basin is divided from the Hampshire basin by some movement that has thrown the strata down at a violent inclination towards the North, and that some similar movement passed through the Isle of Wight, and if reference be made to a map of the world, it will be seen that the whole of Earth's crust has been influenced by a similar action (due to Earth's change of angle), giving to it not only an inclination to the North or now N E, but actually sending it up bodily to the North, whilst the "New Siberian Islands" are said to be composed of mud and bones, a remark that equally applies to Siberia, which terminates at the Gulf of Obi, a little to the East of the North of the Ural Mountains

And as Jupiter revolves on his axis at the rate of 28,000 miles an hour, while Mars only attains a speeed of 630 miles per hour, it may reasonably be assumed that throughout the Secondary and Tertiary formations there was a progressive decrease in the rotation of Earth, and it is said by a high authority that "in general no contrast can be more complete than "that between the Secondary and Tertiary stratified rocks, the "former retaining so much uniformity of character, even for "enormous distances, as to appear like the effect of one determined sequence of general physical agencies, the latter exhibiting an almost boundless local variety and relations to the "present configuration of land and sea not to be mistaken"

What power produced Earth's changes of inclination, we suspect, must ever remain a mystery, but assuming that the compression of Earth was due to the change of electrical state from that of the orbits beyond the outer ring of the Asteroids to that on this side, or, in fact, from a negative to an electrical medium, however slight the change, such a condition would have a lifting influence on the more negative matter below, to the production of mountains on those parts of the earth where there was the least amount of resistance or of protection by a covering of such matter as the Tertiary formation

And from the now N W of America to the N E of Asia, when the several parts of the Earth were still united, there were raised the first mountain chains, the several parts of which still exist as the Rocky, the Andes, South Polar, and those of Asia, &c

No doubt the raising of these vast mountain chains was a slow process, which took place long after the creation of man It is thought that Cusco, one of the ancient South American cities, was built when the Andes were not nearly so high as at present

When gravitation, the cause of the contraction or repulsion and lifting from above, began to exercise its influence, it would appear reasonable that it should be greatest on the most dense and best conducting materials, and thus cause a depression sufficient to connect that part with the crust of the nucleus, so as to create valleys and retain the waters in their then position, the other portions of land being still floating masses These, however, in their turn would gradually sink, and if there were at the time an increase in the waters, the "universal deluge" is readily accounted for That is some parts below, the others above the waters, as represented on Mars, as we have already observed

How long this state of things lasted, in all probability man will never be able to determine, but that the deluge was not universal, an inspection of the Surrey Hill formation in the neighbourhood of Farnham will, we think, determine That the waters in some places were of great depth, the writings on the perpendicular rocks of the Orinoco, now at more than two hundred feet above the banks of the river, clearly demonstrate

EARTH IN THE ORBIT OF THE ASTEROIDS.

CHAPTER VIII

Respiration—Protoplasm—Life in the various orbits through which Earth has passed—Examples of Tertiary deposits at Eaglehurst and Mopley Pond, at Fawley, Hants, at the Devil's Jumps, Moor Park, Tilford and Wrecclesham, near Farnham, Surrey, in Patagonia, South America, at Maestricht, Holland, in France—Marbles of the Mediterranean—Loess—Old Red Sandstone and Tertiary Sandstone compared—Examples of fossil wood and of frogs entombed in coal and gravel—Pebbles at St Ann's Hill, Chertsey, Surrey, and in Iceland—Explanation of the formation of conglomerates, &c

UNDER whatever conditions the warm-blooded, breathing animals came into existence, respiration, *which decreases with decrease of electrical condition of the air*, as already stated, could not then have demanded a constant supply of food as it now does in our more electrical atmosphere, and that demand, the main cause of our brute passions, must have been developed only when the mammals were capable of self-preservation Let us see, then, what are the facts of the case

We have read somewhere that the vegetation of the coal-bed formation must have been of the lowest order of protoplasm If, then, there be a lowest order, there should be the highest, with, of course, the intermediary, and this protoplasm we will regard as the germ, whether of the animal or vegetable kingdoms This germ, then, in the orbit of Saturn, produced a strange kind of fish calculated to force its way through mud, and in that of Jupiter reptiles distinct from anything now on Earth, which disappeared before or soon after the entrance of the planet into the Asteroid orbit

If, then, the above outline be approximate only, man and all other animals may have been produced in the absence of food, and, necessarily, were pure, and if that which is within us, the origin of the soul, mind, or conscience be independent

of the body, there can be no reason why after death it should not return to the realms from whence it came do, in fact, as must do the gases of all the matter constituting the rocks of a decomposing planet like Mercury—*i e*, travel back to the earlier orbits This idea opens up a wide field for the imagination, but we will not enter upon it here

The standard of life seems to have kept pace with Earth's advance to the Sun, and that in each orbit which Earth successively occupied there were evolved higher types or forms of life Electricity is the cause of life, and it would appear that Earth's standard of life advanced, keeping pace with the greater amount of electricity in the orbit she was occupying, for instance, when Earth was in the orbit of Uranus there were only elementary forms of life, such as zoophytes and a low order of bivalves

In Saturn's orbit fish were abundant These nearly died out, and were followed by a number of Saurians

In Jupiter's orbit the forms of life included reptiles of a mammalian kind, gigantic crocodiles, Saurians of whale stature, winged Saurians or bats of enormous size, all kinds of fish, reptiles of bird form, frogs and toads of the size of a large hog, &c

In the Asteroid orbit the Saurians had all disappeared and the reptiles decreased, gigantic mammalia appeared, which after a long period of time—some ages, in fact—also became extinct

These were followed by animals successively advancing to a higher type of life, till, when Earth was in the inner ring of the Asteroids, man was created

At Pittsdown, Surrey, the oldest human skull has been unearthed Dr Woodward has proved that this skull is of as low a type as that of the lowest existing savages of to-day, the front teeth resembling those of an ape This skull is the missing link between man and the lower animals, and this class of beings was followed by higher types, constantly advancing till a human being was evolved capable of understanding the God by whom he was created, by which time Earth had probably reached the orbit of Mars

Those who wish to have a detailed account of the many forms of pre-historic life should read Nicholson's "Paleontology," which gives a fully-illustrated account of this interest-

ing part of our Earth's history, and is as delightful as a fairy-tale, only it is all true!

We will now give some examples of the latest Tertiary deposits which, as we explained in Chapter VII, fell upon Earth as clouds in the orbit of the Asteroids

The very peculiar formation we have designated the "Surrey Hill Formation," from its having engaged our attention only in Surrey, we have reason to believe extends into adjoining counties In all our researches we have discovered no trace of shells, which may in some measure account for its having been associated by some geologists with the greensand under the chalk, and by others with the Boulder or Erratic period

The beautiful order of superposition in a sand pit at Mopley Pond, about a mile to the N E of Eaglehurst, near Fawley, Hants, suggested in 1868 the laying bare a mound to the depth of the blue clay line, and the following facts which have forced themselves into notice cannot fail, we think, in throwing much light on the sandhill formation

The depth of the sand below the horizontal silicate or blue clay line we are unable to state, but it is considerable The sand is in layers parallel to the clay line, as are also those immediately above, whilst at about four feet higher there are two sets of lines of sand of three each, crossing each other, *yet continuing perfectly distinct at the crossing, although* ultimately merging into one line—an effect, we conclude, which nothing but nebulous conditions could bring about They are, in fact, simply a repetition of those of the specimen already referred to, which specimen would appear to be of primary formation

On the other side of the valley at Mopley, and through which valley runs the water from Mopley Pond, there is another sandhill gradually rising to the North from the Valley, and here the sands, which are much more brilliant and diversified than are those of the hill above referred to, are also in perfectly horizontal layers, there being, however, this striking difference Whilst the sand of the first hill referred to when handled feels like flour, and the grains to be seen require a good magnifier, that of the opposite hill is harsh or rough, the grains being readily visible to the naked eye These two hills are not more than 150 yards apart, and probably were formed before they were deposited on Earth in the orbit of the Asteroids

Most of the sand in the neighbourhood of Farnham is

coarser than that at Fawley It is, in fact, similar to the fine gravel between the Hampshire flints There are, however, hills of fine sand, and in the Waverley estate, near Farnham, soft rocks of that material The great characteristic of that formation is a belt of hills, running from N W to S E, composed of sand combined by oxides of iron, both black and red, forming both lumps and slabs, and of lumps of sandstone of most singular formation

About four miles to the S E of Farnham there are three hills, known as the "Devil's Jumps" The one to the W has been dug for planting, and about one-third down it there were,

FIG 6

Near Farnham Devil's Jumps and Frensham Pond

in 1870, when we inspected the hill, large piles of convoluted lumps and sheets or slabs of the black oxide Midway down, detached lumps of sandstone and of oxide intermixed, and nearer the base lumps of sandstone only, whilst at the top of the hill, on which stands a small house, there is a large mass of the ironsand rock

On a smaller hill or cone, no doubt within his Satanic Majesty's jump, an observatory was being erected in 1870, and the excavation exposed to view this oxide in very considerable quantities at the top of the hill, most beautifully intermixed

with or rooted in the sand, but all white sand below, whilst the third hill, further to the E, is *capped* with a gigantic mass of this oxide of about 70 by 40 feet, one part being 8 feet above the sand in which its base is embedded, and in all probability *rooted*, forming, in fact, part of the hill

This lump or hill, when it came down as a cloud, was evidently in the gaseous state, and as the meteoric dust (collected by the Committee appointed by the British Association) contained spherical particles of iron, which, as the Committee state (1883), must have been in a molten state to have taken that form, it is conclusively evident, as this dust was collected at a very high altitude in the snow on the Himalaya Mountains, that to have fallen on the mountain it must have come from higher regions, so that, as already stated, the gas of iron is actually lighter than air, and as iron is said to be six thousand times heavier than air in the condensation of gas, there must have been *an increase of density* or weight of at least more than six thousand times

We have said that the Devil's Jumps are capped with iron sandstone When the hills came down on Earth in the Asteroid orbit, it would appear that the gas of the iron was actually lighter than that of the sand, otherwise it could not have maintained its position on top, and in this fact we have something like evidence that at the period of Creation in the Asteroids gravitation began to exercise its influence The gravitating influence in this period we conceive to have been in the soil, and so far as facts indicate the soil appears to have maintained that influence to comparatively within a very recent period, but, of course, to within only a certain distance from the surface of the earth It is well within our recollection—when, in fact, of adult age—that the rain "plummed" the earth —that is, made it spongy, but which it no longer does, for the reason that the earth is no longer sufficiently positive to repel *the electricity of the drops of rain*

This lump of rock on the Devil's Jumps has, apparently, very little loose sand associated with it, and the same condition prevails with a lump on the top of a hill near the grottoes at Moor Park, near Farnham, and numerous other places, but the oxide of a large "rock" on the opposite side of the river, near Moor Park Lodges, is in large and very small thin tubes or convolutions, all of which are not only filled but

are actually packed with sand, whilst within gunshot there is a hill having on the top, about 5 feet thick of a very dark red oxide, resting on a layer of sand of about 10 feet thick, and at the base another layer of the oxide but of a lighter red —in fact, some such disposition as that of the coal measures, iron beds, and rock-salt formations

The most solid parts of this curious formation bear the appearance of being a black oxide, but if raised to red heat in a crucible, then allowed to cool so that it may be crumbled between the thumb and fingers, the quantity of metal will be found hardly appreciable—sand constituting the bulk—a fact that has preserved these treasures from man's cupidity as they do not now pay for working, though it appears that before the introduction of coal for smelting iron many quiet country villages in Surrey, such as Leigh, Charleswood, Newdegate, Abinger, and Wootten were once busy centres of iron smelting, ordnance works being carried on to such an extent that an Act of Parliament had to be passed to restrain them as the oak forests were being denuded to supply fuel for the furnaces

At Westcott, near Dorking, at Abinger, and other places in Surrey, quantities of ironstone tubes have been dug out of sandhills Those portions disinterred when trenching the land for cultivation, and consequently not more than 2 feet from the surface, are detached pieces of from 1 to 3 inches thick, generally black and flat, and, placed on edge, are used for paving yards and streets, the foot pavement of Farnham being almost entirely of this material, but they are frequently found of the most fantastic forms, the texture ranging from sand to coarse gravel or very small pebbles, evidently not of denudation

All the latter compounds are either on the top of or a little beneath the surface of the sand, but at Tilford, a village near Farnham, Surrey, large isolated masses are excavated at 12 or 15 feet from the surface—to use a workman's expression, "as big as a barrel"—which, on being broken up, are used for building enclosure walls, and in these formations are found tubes of ironstone of various thicknesses, a piece in our possession, a foot long and 4 inches thick, has a hole in the centre of about an inch across throughout full of hard or very compact sand

Under whatever nebulous conditions this oxide was de-

posited, similar conditions are observable in the sand deposits At Wadebridge, about seven miles to the south of Farnham, there are quarries of a comparatively soft sandstone that comes out in detached pieces, the layers being separated by layers of sand, and which stone hardens on exposure to the atmosphere, whilst at Dippenhall, a mile to the north of Farnham, are quarries of a silicate, when hard of a beautiful white, in every respect so much like a chalk-pit, that nothing but the acid test convinced us of its not being chalk While prosecuting this inquiry, to our surprise we detected, between well-defined layers of the silicate, a small layer of chalk, a large layer of the same material, but of a harder nature, "the blue stone" being on the top Both layers are on the north side of the hill

Immediately to the north of this hill it is all chalk, whilst at about a mile to the south, at Wrecclesham Bridge, there are, embedded in sand, huge masses of the iron sandstone, but into the composition of which enters a large quantity of silicate, discoloured, however, by the oxide, and in one lump from this pit we detected two circular holes of about an inch deep and an inch in diameter, full of the soft silicate of the hill to the north, which, if any reliance is to be placed on facts, shows an intimate connection between the three formations, and unquestionably casts much doubt on the period of this chalk formation The flints in some of these chalk hills are not in layers, but are dispersed without any apparent order

We have already referred to the extreme fineness of some of the sand near Fawley, but that of deserts, we should think, must be finer still, and on Patagonia the Tertiary formation, "differently from Europe, where it appears to have accumu- "lated in bays," along 500 miles of coast there, is one great deposit These beds are covered by others of a peculiar soft, white stone, including much gypsum and *resembling* chalk In places they are 800 feet thick, and are everywhere capped by a mass of gravel, forming probably one of the longest beds of shingle in the world, its thickness being more than 200 feet and average width 200 miles—so, at least, says Dr Darwin

From what source, then, was this mass of matter derived? It is evident that it is confined to Patagonia, which was in the line of depression, and as it is only on the east side of the mountains, *and not on them*, it may reasonably be assumed that

it reached *its* present destination from the North when America formed part of the belt, the "peculiar soft white stone (? a "silicate) including much gypsum," rendering highly improbable its being locally of original formation

It is said also that near Maestricht, in Holland, the chalk with flint is covered by a kind of chalky rock (? the silicate of Farnham) with grey flints, over which are loose yellowish limestones, sometimes almost made up of fossils Similar beds occur at Saxoe, in Denmark, and of the Cretaceous formation we are told that in Saxony and Bohemia the whole section is

FIG 7

a = Sandstone, dark red and soft
b = Dark convolutions of iron sandstone
c = Silicate

reduced to "beds of flints", whilst in France, the Maestricht (?) beds rest on the chalk with flints from all which it would appear that long subsequently to the Tertiaries there was a further chalk formation, or of carbonate of lime, and possibly of flint, and as these occurred before the Boulder or glacial periods we cannot be at a loss to account for the formation on Patagonia, but of the nature of the shingle we are not informed Clearly were it from the chalk proper, the flints and chalky matter would have been intermixed, or the flints may have been floated from the ocean on the North as erratics

or frozen masses It is further said that this vast Patagonian accumulation is in five great terraces sloping eastwards—in fact, "sea beaches" On Hungry Hill, to the north of Farnham, there is a gravel-pit the flints of which apparently partake of both the chalk kind and of the gravel One from there now in our possession, which is roughly cylindrical in shape, with apparent roots of branches, measures 16 by 4 inches

It is said that the marbles of the Mediterranean are not mottled, as are the primary limestones, and the Carrara is *white* and *fine grained*, whereas the Wenlock limestone of the Upper Silurians "is a mere mass of the remains of corals, "crinoids, and trilobites, *held together by shale*" These Mediterranean limestones, if we mistake not, extend far down the line of depression to the South, not excepting Australia, then in the "line,' and its islands to the North, and are not original formations

In the neighbourhood of Farnham, as in all other sand formations, depositions of clay are not wanting, and there are also extensive beds of a material known as loess (brick earth), a most *intimate combination* of clay and sand, as distinct from the mud of a river as any formation can possibly be, and whether it came down as a cloud on the top of the sandhills, many of which it covers, and some of it was afterwards washed into the valleys between the sandhills or was floated in by water, the total absence of any foreign matter demonstrates conclusively that it is not an alluvial deposition, yet on this formation, on the Continent, the antiquity of man has been assumed at 180,000 years, although "to restore in imagination "the geographical outline of Picardy, to which rivers charged "with so much homogeneous loam and running at such heights "may once have belonged, is now impossible"

Were it possible to divest the mind of the awe and wonder with which it is overwhelmed in the contemplation of these gigantic masses of matter, we might discover a simplicity of operation that to us would be no less surprising

In the Old Red sandstone or Silurian era, before the coal-bed formation, the matter was permeated throughout by a dark oxide of iron which possibly ultimately became the combining agent, an operation that was repeated in the New Red after the Carboniferous, the visible combining agent being, however, of a lighter red, and in this sandhill formation the last of

the Creator's works, so far as regards this planet, iron is again the combining agent, but instead of its being diffused throughout, the sand is mingled with it only in patches or lumps In the Old and New Red sandstone, the compounded matter is disposed in layers, one sheet being placed on the other, we are told by Hugh Miller, like sheets from a printing press, whilst in this last deposition the flatness is superseded by all manner of convolutions, and, although totally distinct, there is an admixture of the materials, thus in the centre of a large mass of the lumps of iron sandstone at Wrecclesham Bridge, as already observed, we found two round holes of about an inch in diameter, full of the soft silicate of the hill a mile to the north, whilst the stone itself is partly a silicate and partly ironsand. Both materials, however, being distinct, fully bore out this conclusion, since neither in the coal nor sulphide of iron have we been able to detect any difference at the points of unison, a fact we should hesitate in adducing did it stand alone, coal being a mineral

Not so, however, with wood, and we have been so fortunate as to become possessed of a specimen of a piece of wood, ap-

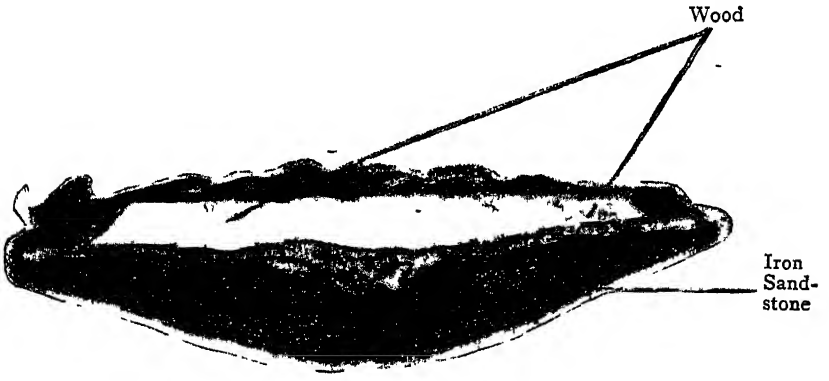


FIG 8

Fossil wood in a bed of iron sandstone from which the lid has been removed.

parently of "tropical origin," 2 feet long and *3 inches* in diameter at one end and 2½ inches at the other, entirely surrounded by a thick coating of the iron sandstone of Farnham, which clearly shows by its form that it flowed round the wood and took its shape from it, the holes in the wood being filled

with it It is quite evident that the wood could not have made its way into the iron shape after the latter was formed, as the iron forms a completely closed case like a coffin, enclosing the wood In no part of the wood is there the slightest sign of heat, although the end of it, 3 inches in diameter, is thoroughly impregnated with the *gas of iron*

This specimen is now in the Geological Museum, Jermyn Street, London A sketch of it is appended, with the lid removed

This specimen, enclosed as it is in a coffin of iron sandstone, surely is conclusive proof that the latter fell upon the wood in a gaseous form, otherwise it would not have been moulded to its exact shape

Two other facts of similar import were recorded in the "Daily Graphic," January 1915, with a sketch of a lump of coal and a frog, described as follows. "A frog and the piece "of coal, in which Ernest Giles Brain, a Forest of Dean collier, "says he found the frog alive on January 14, 1915 Brain "asserts that when he dug the frog out of the coal it began to "hop about Mr Walter J Bick, of Bristol, asserts that about "forty years ago he found a live frog in a gravel vein, where "it must have been entombed for thousands of years"

These two examples can only be explained by our theory that the coal and the gravel, like the iron sandstone, both fell upon Earth in a gaseous form, only at an interval of some thousands of years apart, the frog in the coal being entombed when Earth was in the orbit of Saturn and the one in gravel in the Asteroid orbit Frogs, we presume, are a link between the animal and vegetable kingdoms, *and evidently do not breathe*, else our two little friends would not have been able to hop about when released after their long hibernation of many thousands if not millions of years

In a sand-pit at the foot of St Ann's Hill, near Chertsey, we found two small lumps of the iron sandstone, but the very peculiar formation of the neighbourhood consists of a conglomerate of very round, mostly unbroken pebbles, blended by both sand and iron-sand, lumps of which are found at various depths from the surface, being turned up by the plough and dug out so far down as 15 or 20 feet, and it is said that in Iceland there is a hill the ground of which "consists of shingle "and small stones, all water-worn and rounded, and laid on a

"substratum of sand as smoothly and regularly as if the whole "was the work of man," but of the nature of the substratum of sand we are not informed, nor is any opinion hazarded how in those high latitudes the shingle and small stones were "water-worn", whilst the whole of the top of St Ann's Hill and several other hills near Chertsey, are covered with these round pebbles, from the size of swan-shot to that of large marbles, and, so far as we can see, warrant no other conclusion than that of their having come down as a shower, and, as we have already observed, the sand of the hills at Farnham must have come down as part of the hill, or else in alternating showers of sand and of the gas of the iron There stand the facts, and if we go back some stages further—to the Primaries, the granite, &c—facts no less convincing present themselves

Dr Ure was not only an honest original thinker in chemistry but also in geology, and in reference to conglomerates he states "Another class of substances embedded in the Secondary "strata, and throwing light on the convulsions amidst which "they have been formed, are the pebbles or rolled fragments of "rocks *older than themselves*, which they are often found to "contain Thus the lower beds of the supermedial order "(namely, the conglomerate rocks of the New Red Sandstone) "contain in great abundance rolled fragments of the carboni-"ferous limestone *belonging to the class next below it* (the medial "order), as well as many of the still older rocks, being, in fact, "only a consolidated mass of gravel composed of *débris* of "those rocks" From which we learn that Earth having completed her coal-beds in Saturn's orbit in her onward journey to the Sun, carried, as gases or atmosphere, a large amount of matter to the next formation or orbit, and there deposited it in a more advanced stage of formation, so advanced towards consolidation in fact as not to undergo any change whatever in subsequent arrangements of the strata But the geologist having no other compounding medium than the ocean deduces "the accessory inferences from this fact—first, that the rock "from whence the fragments were derived must have been "consolidated, and subsequently must have been exposed to "mechanical violence (probably the action of agitated water), "which tore from it these masses and rounded them by attri-"tion (before the rock in which these fragments are now em-"bedded was formed), and, secondly, since loose gravel beds"

(and such must have been the original form of these, though now consolidated into conglomerate rocks) "cannot be accumu-
"lated to any extent from the action of gravity on a higher
"inclined plane, we are sure when we find such beds, as we
"often do in nearly vertical strata, that this cannot have been
"their original position, but is one into which they have been
"forced by convulsions (probably due to Earth's contraction),
"which have dislocated them subsequently to their consolida-
"tion" "These consolidated gravel beds are called con-
"glomerates, breccias, or pudding-stones We find them among
"the transition rocks in the Old Red Sandstone, in the mill-
"stone grits and coal grits, in the lower members of the New
"Red Sandstone, in the sand strata beneath the chalk, and in
"the gravel beds associated with plastic clay, and interposed
"between the chalk and great London clay," affording, in fact, conclusive evidence that when the bond of union was wanting to blend the stones into conglomerates as they came down from above, they formed gravel And in the last of the depositions, hills of gravel, interspersed with sand, are not wanting From the Thames at Chertsey, within the last few years, there have been dredged up thousands of feet or yards of gravel, but notwithstanding a most minute investigation the rounded pebbles are conspicuous by their absence

We have already assigned reasons why the air as it formed might have been confined to the North, and that the last of the depositions were the Surrey Hills, which are composed of the lightest of materials

If the several parts of Earth's crust be placed in the respective positions they formerly occupied after the land was brought northwards by the change of angle, England and Norway will form part of the circle which was around the Arctic circle, if a circle were there, and, as a matter of course, the Surrey Hills, which do not show any evidence of ever having been submerged, must have been just within the circle

Possibly by the time Jupiter shall enter the Asteroid orbit to receive his Tertiaries there may be sufficient indications to be able to form some idea of the kind of bodies which constitute what is designated as "greensand," but which we call the Surrey Hill formation This formation, so far as we have been able to discover, is as distinct from the Tertiaries as the Tertiaries are from the Secondaries

EARTH IN THE ORBITS OF THE ASTEROIDS AND MARS.

CHAPTER IX

Changes in Earth through contraction and expansion—Causes of contraction—Where contraction and expansion took place—Examples of contraction, by Sir James Hall, Hugh Miller, and Mr Scriven Bolton, F R A S —Disturbance of coalfields and the commencement of Earth's mountains due to contraction—Her land still in one mass at the period of maximum compression—Beginning of break-up of mass of land—Oceans become salt—Raised beaches—Mountains how formed—Gravitation—Its effects rocks and metals drawn up to the surface

WHEN our Earth was in Jupiter's orbit, we assume she was like that planet now, in constitution, with a vaporous envelope some thousands of miles deep and with a very much larger diameter than at present of her inner core or body But we do not contend that every planet becomes the same size in the same orbit, but that each orbit produces special conditions which cause all the successive occupants of that orbit to have a certain resemblance to each other, accompanied by a great variety of detail

During the thousands of years Earth passed in the Asteroid orbit she was slowly contracting, owing to the electrical orbit she revolved in, from which resulted the formation of her atmosphere and oceans, and the cooling, hardening, and drying of her rocks From these processes, long continued we assume, she became much smaller than her present 8,000 miles in diameter

That both contraction and expansion took place in our globe is without question, from the evidence afforded by the Earth's surface. Probably our globe underwent contraction whilst passing through the Asteroid orbit when between 468 millions of miles to about 144,000,000 from the Sun, and this contraction was followed by expansion when our planet was between 144 millions of miles to about 120 millions of miles

from the Sun, when we assume she had acquired her present dimensions of nearly 8,000 miles in diameter

The following extracts bear witness of the compression to which our Earth was subjected —

"We are informed by geologists of many parts of the earth "having been subjected to violent compression, as illustrated by "curved strata, the foldings of which extend through miles of "coast and hundreds of feet deep"

"To illustrate this formation Sir James Hall made a pile "of several layers of cloth, on which a heavy book was placed,

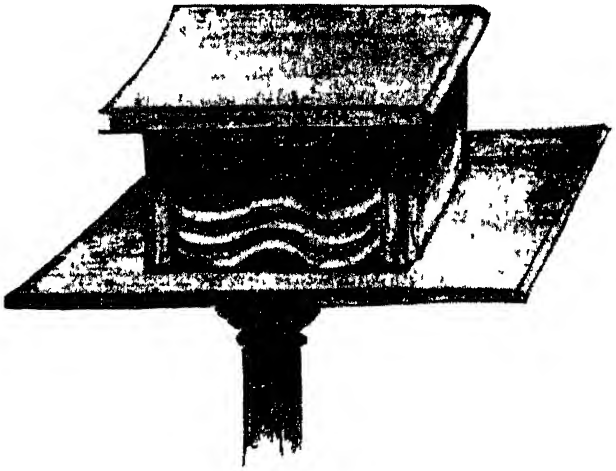


FIG 9

Sir James Hall's experiment repeated with layers of cloth compressed by books

"and, thus compressed, squeezed the ends with two other "books"

"In other cases the strata take a zigzag form, in fact, "every kind of declination that might be conceived on a vast "extent of soft matter being subjected to violent compression "in all directions alike"

Then there are demonstrated by drawings "gigantic curves "of calcareous shale of from 1,000 to 1,500 feet in height, in "which the beds sometimes plunge down vertically for a depth "of 1,000 feet and more before they bend round", and we

are told of "contortions in crystalline schists, now of such "hardness that they could not be supposed capable of as- "suming such forms without being shattered, *had they not been* "*at the time in a soft state*, also that the more marked ridges "of stratified deposits appear to have acted in lines related "to the great circles of the Earth," for all which the geologist does not even attempt a reason, but which we think, it will be allowed, are strictly in accordance with the premises enunciated in the preceding pages

By geologists the primary formations are represented as having been brought to the surface by volcanic agency, which it is supposed prevailed throughout the whole period of formation But we are told by Hugh Miller, a self-made man and an original observer 'And who that has surveyed the contor- "tions, the bends, the inflections, the ever-recurring rises and "falls of the more ancient stratified rocks, such as our grau-

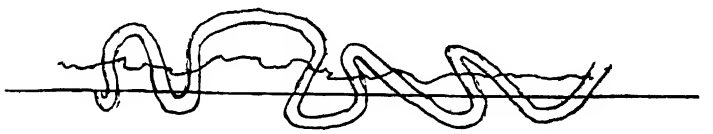


FIG 10

Diagrammatic section of Mount St Gothard (from "Harmsworth's Encyclopedia," illustrating land compression)

"wacke for instance—bends and inflections that forcibly remind "the geologist of the foldings of a loose robe, *grown greatly* "*too large for the shrunken body which it covers*—or that has "weighed the yet further evidence furnished by the carboni- "ferous vegetation, extra-tropical in character, even in Green- "land—who, I say, that has considered this evidence, will "venture to decide that the Earth's temperature was not higher, "*nor the Earth's radius greater*, in the days of the Silurian or "Carboniferous periods, than it is now?" We are further told by the same high authority that "the gneiss region of Scotland "contains nearly ten thousand square miles of surface, the "mica-schist fully three thousand, and the quartz rock and clay "slate united about fourteen hundred miles more, composing "almost all the highlands of Scotland, with the greater part of "two of our lowland counties, Banffshire and Aberdeen, their "entire area, if we add about fifteen hundred miles additional

"of granite and primary porphyry, does not fall short of six-
"teen thousand square miles"—a mass of matter that obviously could not have been brought to the surface by volcanic agency to the obliteration of the subsequent formation, whilst in the Silurian and other primary rocks of Russia, as in those of Greenland, there are coal-beds that completely dwarf those of Scotland. If we mistake not, the coal-beds of Ireland are near the surface, whilst "those of the River Tom or Tem, in "Russian Asia, are cropping out of a mountain, and the upper "bed is 12 feet thick, resting on a stratum of grey and yellow "rocks, 8 feet in thickness Beneath these is another seam of "coal 10 feet thick, which rests on a bed of apparently similar "rocks 12 feet deep, and below these the edge of another bed "of coal, but how thick could not be ascertained by our autho-"rity", and it is also said that in some of the coalfields of England large portions and even whole beds of coal are want ing, their disappearance being, as a matter of course, assigned to denudation, but the impossibility of which denudation could readily be demonstrated, even supposing the existence of the ocean at the time of the coal-bed formation In fact, as already stated, the Secondary and Tertiary formations consti tute but a speck of Earth's crust

Mr Scriven Bolton, F R A S, writing in the "Illustrated London News," May 9, 1914, says "According to Laplace, the "planets have been evolved from one gaseous cloud. Hence, "it may be, the material properties of each are similar"

"The same cooling process and *contraction* are shared by "all Jupiter, 800 times larger than Earth, might represent her "in the youth of her career millions of years ago"—to which we would add, "when Earth was in Jupiter's orbit"

On these effects a most interesting chapter might be written, but we will proceed to the consideration of the events con-nected, as we conceive, with Earth when at 144 million miles from the Sun, the distance of Mars from the Sun in 1862, which position Earth occupied when of her smallest diameter of perhaps only about 4,000 miles At this period we assume the greatest amount of compression of our Earth had taken place, and the depressions, now the Atlantic, &c, had produced such effects as the "ridge" in North and South America, form-ing in the parts of least resistance the bases of such chains of mountains as the Rocky, the Andes, the South Polar, and those

of Asia, all of which were then united, and hills such as the Mendip, those of Wales, of Scotland, &c, but all of Primary formation

At this period, the land which was still in one mass covered the greater part of the surface of the planet, as represented, in fact, on the planet Mars (Fig 11), with a surface interspersed with islands and sheets of water, some parts of the land that is being below and others above the waters, and more clearly to define our meaning, it may be stated that the N W corner of South America still filled up the Gulf of Guinea, whilst the south of this continent connected with and

FIG 11

Mars, from a drawing by Scriven Bolton, F R A S, in "Illustrated London News," May 9, 1914

Land, white, water, dark

extended beyond the Cape of Good Hope We will assume that throughout the whole of this distance—that is, of America and Africa united—there was a deep depression of the land, and that at the appointed time when the expansion of the planet began to take place on our onward progress towards the Sun, an opening was formed throughout the whole of the distance separating North and South America from Africa and Europe What, then, would follow? Evidently the waters from the North would flow through this opening and other

channels, such as between Asia and the West of America, to the South, to the formation of the Pacific and Atlantic Oceans, and the waters on their flow over the saline earth having become salt would then produce coral islands, whilst in the North, periodically with the decrease of the waters, there would be produced what the geologist calls "raised beaches," under the supposition that they were caused by the raising of the land, but these beaches indicate the extent of land drainage produced by the periodical escape of the waters as the globe expanded These beaches would necessarily be at a common level, and at a much later period, when the drainage was more rapid by increase of openings, the waters carried with them such matter as now constitutes the boulder period

Connected with this period there are certain great facts which it would be futile to evade in this inquiry

On the west side of America there is a chain of mountains stretching from north to south which has an altitude of nearly five miles above the level of the sea, and on the eastern side of the other half of the world there is another chain of greater height, the intervening country between these two chains being interspersed with mountains of less magnitude, such as the Alps, &c

These gigantic elevations, which did not arise till a much later period, are assigned to two causes—upheaving from below, and the contraction of the earth while cooling having squeezed out the liquid matter from within, but no reason is given to explain why matter which is *gradually cooling and contracting* should have an *upheaving* influence imparted to it, also if the matter were "squirted" out by the contraction of the crust the liquid would do little more than fill the fissures

These two reasons are, therefore, not tenable But Sir J Herschel admitted that gravitation is referable to some electrical condition, and Professor Faraday allowed that oxygen is highly electric, we have, therefore, all the conditions necessary to explain the successive operations under which the earth was brought to its present condition

Nor will it in any way affect the question whether, in point of fact, oxygen be merely a good conductor of electricity, or is electric within itself?—a question of high interest for inquiry hereafter, in conjunction with the different electrical conditions of all elementary bodies and chemical compounds, for the

present we will accept Professor Faraday's admission, and regard it as highly electric

As the carbonic acid atmosphere was disposed of during the Carboniferous period, and replaced by one of oxygen, it is clear that the earth must have been progressively, but very slowly, subjected to the combined and increasing influences of induration and uplifting as the oxygen atmosphere increased in volume, when the earth and air were cool enough for these effects to take place, the hardening of the matter being referable to the absorption of electricity, the bond of union in matter, and the *uplifting*, not *upheaving*, being the natural consequence attendant on two bodies being brought within each other's influence when in opposite electrical conditions—combined operations that would not fail in preparing the soil for the vegetable kingdom

It is observed, in reference to the Carboniferous period, that "some of these conditions have been repeated in a fainter "degree at subsequent epochs, and have given rise to limited "carbonaceous deposits, but as the various changes, physical "and organic, working in the Earth's crust advanced towards "the present state of things, an approximation to the condi-"tions now observable, and a receding from those which once 'so greatly promoted the growth of succulents, are in strict "accord with the laws of Nature," the latter part of which remark applies, we believe, more to a later period in the creation than to that which immediately followed the coal-bed formation

When gravitation came into operation, the liquid mass of matter under the crust being also subject to its influence, its upper portions must have been the first acted upon, such action being much greater at some periods than at others This mass, then, would be periodically drawn to the surface, and on an inspection of the granite formations these will be found in layers, as if deposited at different periods

The headlands of Castle Treryn, in Cornwall, afford perhaps as striking an illustration of these operations as could well be adduced Here are rocks of a gigantic nature actually thrown out of their perpendicular, but still retaining the order of successive layers of rock as formed by the periodical outpourings from the liquid portion of the Earth's crust, whilst the layers, on which rest the Logan Rock, have not been dis-

turbed from their upright position by the uplifting of the soil on which they rest, showing that they were hardened before the lower layers were brought to the surface Other beautiful illustrations are also afforded by the coast of Cornwall, where many of the headlands in the north are several hundred feet high

The gradual raising and draining of a great portion of the land would prepare it for a more general and more fibrous order of vegetation, calculated to accelerate the generation of the oxygen atmosphere, which, when its influence was unimpeded, was able to produce those gigantic effects so evident throughout the world

About this period, we conceive, the materials composing the Old Red Sandstone in Scotland were upraised, but these effects, as in the first solidification of the earth, could not have been continuous, but periodical

Oxygen is a rapid chemical agent, and readily combines with carbon, either under the influence of combustion or the decomposition of vegetable matter, and, therefore, when it came into contact with the earth, could not fail in generating large volumes of carbonic acid, which would arrest its operation on the lower lands

Whole forests fell a prey to this devouring element, which, being soluble, would by this property gain access to the vegetable matter in water, by which action the whole of the hydrogen of the water was converted into a light carburet and a portion of the carbon into carbonic acid, and anthracite is of more recent origin than coal

We are now, however, referring to principles connected with the formation of *our* atmosphere, which we have already explained We will, therefore, for the present merely remark in reference to metalliferous formations that the high attractive powers of a highly positive electric body on one equally negative must necessarily have been deep-seated, and, consequently, would draw up not only the elements of granite but also the ponderous metals, many of these possibly in a gaseous form; and as at the same time acids would be formed, more especially the sulphuric, to the subsequent action of these must be referable the condition in which we find some of the metallic veins.

It must be equally clear that the heavier the metal, the

lower its original position must have been, and being brought to the surface under high electrical conditions must necessarily, as a general rule in the Earth's crust, occupy the highest, although in its ascent it could not fail in carrying up with it matter of less specific gravity, such as silica and other component parts of granite

Gold, which is not acted on by acids, is found intermingled with quartz in a pure state, but the baser metals in lower districts, such as Cornwall, although frequently native, generally exist as salts We have in our possession a beautiful cluster of quartz and copper ore, which affords evidence that the crystallisation of both was simultaneous, and its granite base also contains the metal

EARTH IN THE ORBIT OF MARS.

CHAPTER X

Boulder and erratic periods—Dolmens—Moraines—Coasts of Cornwall and Devon contrasted with that of Brittany, Côtes-du-Nord—Metamorphosed rocks—South Downs contrasted with North of France—Stratification of strata due to nebulous formation—Examples near Farnham—Immense boulders in British Guiana and Jamaica—Dolmens erected on contiguous lands—But little weight during Boulder, Erratic, and Dolmen periods—Quotations from "Vestiges of Creation"—Easter Island and other buildings erected when Earth's gravity was slight—Gravity of Mars—Pyramids of Egypt—Tomb of Osiris—Buildings of E Mexico—Temple of Bora Budor, in Java—Mosque of Bajapoor, in India, erected before the stones were hardened—Foundations of buildings

THE contraction of Earth, as already stated, produced depressions, although the land so depressed was actually lighter than the waters, but when by expansion of the globe the depression spread out to the formation of valleys, the masses of stone rising to the surface floated in some cases to great distances until grounding, or at a later period still, the freezing influence being in the soil, as expansion of the globe went on, the detached ice formed at the bottom of the water and carried away the rock to which it was attached.

With the Post Pliocene were formerly associated the boulder and erratic periods, but from it the latter has been separated, whilst it would appear that both those operations should be referable to the same cause, although of different periods, and as this constitutes one of the totally unaccountables of geology, we are induced to specially draw attention to it, to its ultimate interpretation, the results of the operation being immense masses of mud and stone or boulders left by water flowing from N W to S E, and gigantic erratics or large stones without mud transported from one locality to another and frequently deposited on now high altitudes

Whether erratics were carried to their present positions by ice, as assumed by geologists, or, as we suppose, were floated

through a depression or depressions in the land from our present N W to S E, it is evident that as land increased by expansion of our globe, which consequently lowered the waters, those gigantic stones could not have been otherwise than highly acceptable to the inhabitants of that period as perches to keep them out of the mud

This brings us to the subject of Dolmens, which have much engaged the attention of antiquarians

Dolmens may be described as being composed of large stones *now* weighing several tons, raised on end, and on the top of which is placed a much larger stone as a roof or platform

As Earth was then much smaller in diameter and also farther from the Sun there must have been but little gravitation on her surface, as on Mars at present, and all detached rocks and soil would necessarily float, there is therefore, as already stated, no need of masses of ice to account for the transit of stones from parts of the land then separated by a small depression But as intense pressure produces intense cold, and even the crystallisation of carbon to the production of the diamond, we readily accept the glacial epoch as a fact General Drayson claims that it was due to the second rotation of our Earth when our axial tilt was 54°, and this idea may be possible

There are also moraines supposed to have been brought down from mountains by glaciers, but "the Steppes of Russia "from North Novgorod towards Pinsk, as far as the confines "of Silesia, is a vast moraine, resembling from its linear "continuity the remains of some vast wall" This obviously was *not* from a mountain, but in all probability one of the results of the change of inclination of our planet

So far as we can learn, the great depth of frozen soil in the north of the world is due to the mass of matter carried there by change of our planet's angle of inclination, but the mountains or protuberances caused by compression were of soil already formed, and every elevation so produced must have had its corresponding depression, at the bottom of which depression there would be much disintegration or crumbling when the soil hardened, and as at the time gravitation was slight, the matter so dislodged would naturally float

Although the headlands of Cornwall and of Devon are

divested of all loose matter, on the opposite side of the Channel, at St Brieux, in Brittany, on the North Coast of Côtes-du-Nord, the granite is covered with a thick bed of coarse sand, used for garden paths—uncombined materials of granite—imbedded in which are large stones of various sizes of a comparatively soft granite, many of the stones being marked on the surface as if tooled They are generally of a rounded form with projecting angles, similar to the Logan stone, whilst others resemble the Dolmens

The surface of the matter of the rocks, instead of solidifying, crumbled into sand, as granite does when deprived by fire of the bond of union Other parts or lumps crystallised partially, whilst the granite below, protected from the early crystallising influence, became in due time the solid rock By the above it would appear that at least the Côtes-du-Nord of France was not subjected to the flow of water of the boulder period, which carried away the loose sand that then no doubt surrounded the Logan and other such stones and the rocks on which they rested Or, what is more probable, as all the harbours of England in the Channel are of deep water, whilst those of France are tidal, the now English coast was under water—in fact, constituted the valley, and when the land expanded and separated, and made Great Britain an island, *ever to remain so*, the rush of water carried the sand into the Channel

Rocks, as already observed, must have been surrounded by matter, but we are told by the geologist that denudation "may "be measured by the *whole mass* of our stratified deposits, as "they have *all* been detached and removed from their primeval "positions," and "that its commencement must at least have "been anterior to the deposition of the crystalline schists of "the earliest epoch, and that it has been repeated during every "successive epoch of the earth's history." In fact that, under Divine Law, one structure was knocked or rubbed to pieces, to the formation of others!

In other branches of science, wherever a difficulty presented itself, rather than confess ignorance, scientists manufactured a term, and the geologist, when theorising on his facts—*and facts without a directing principle always lead to error*—has been driven to the assumption that some of the rocks before him are not what they appear to be, but must have

been something else "metamorphosed" into their present condition

We have already shown that while Devon and Cornwall must have been influenced by some powerful current, the soil on the top of the granite of "Les Côtes-du-Nord" was undisturbed, and we likewise find that whilst the South Downs have had all matter removed from their surface and are smooth, the chalk hills at Dieppe are rugged, with beds of large flints at the summit

Pursuing our inquiry, we find that to the south of Paris there are certain millstone quarries, the stones of which are of both dark and light very rough flints, and which stones—or burs, as they are called—are still in the soft state, and are foreign to the locality where they are found "These burs "are a bed of loose stones of all sizes, from a few inches to "others large enough to cut a $4\frac{1}{2}$-foot millstone out of These "last, however, are very rare The bed is on the side of a hill "(northern), the best stones at the bottom, *lightest at top* It "it about 500 yards wide, and as far as yet known only a "mile or so long The stones are mixed up with sand and "clay and a little gravel The usual sized stones got out are "'from 6 to 8 inches, up to 18 or 24 inches square,' or pre-"cisely the dimensions of the flints on the top of the chalk "hills at Dieppe' Clearly, then, when these stones were transported from their original to their present position, and when the rounded smooth form was given to the South Downs, the chalk hills of Dieppe and "Les Côtes-du-Nord" were above the water or out of the current that washed the South Downs, and whilst the neighbourhood of Rouen is rich in fossil remains, carried there no doubt by water, the Paris basin has the *calcaire grossier*, or the coarse particles of the chalk which supplied the fine for the Carrara marble, in the same way as chalk is prepared for artistic purposes

The nebulous system will greatly assist in the comprehension of stratification, the more especially in reference to the angle of inclination of the strata to each other "If to a "succession of beds having considerable inclination, called "'dip,' to the horizon succeed others perfectly or nearly "horizontal, it is reasonably concluded that the first beds "must have acquired their 'tilted-up' arrangement before the "deposition of the undisturbed horizontal beds, and thus an

"epoch of disturbance or separation is established, the terms "'conformable' and 'unconformable' being applied to the "strata as they preserve or lose their parallelism" But however "conformable" this doctrine may be to cases of disturbance, it is unquestionably very "unconformable" to all the illustrations we have examined in the sand and clay formations Never have we been able to trace the slightest evidence of "disturbance" after deposition, and if the reader, when on his trip to inspect the treasures we have so often revelled amongst in Surrey will stop on leaving Farnham Station, on his right, just outside the gates, he will see a bed of sand (at the bottom of a sandpit), at about the angle of 45°, on which is a perfectly horizontal layer, and on this horizontal layer another bed at *precisely* the angle of the lower bed, which upper angle is clearly not of "disturbance," since the horizontal layer of about 4 feet thick has not been disturbed

These conditions are repeated in a hill in the same locality, in which, however, the intervening layer is clay or a silicate, and from the clay layer there are five offshoots mingling with and at the same angle as the sand, whilst the combination of both clay and sand, with the lumps of red oxide at the right, demonstrate that the mass could have been formed and deposited in no other way than as a cloud In many of the sand-pits the coloured layers partake of all the convolutions of metal formations

The freezing influence being then in the earth and not, as now in these latitudes, in the air, the fresh water of the ocean to the North, and of ponds, froze only in proximity with the soil, from whence the ice, formed, as already observed, by the cold of the earth, would dislodge the "blocks of stone" to which it was attached Erratics are formed only in the line of sinkage, that of the dolmens, and so far as we can trace the glacial influence was confined to that line, or the northern part of it

To what extent the glacial epoch was continuous it would, perhaps, be difficult to determine The geologist, guided by fossil evidence, has apparently arrived at the conclusion that there was a pause, but, then, he also assumed, on other evidence, that mountains which could not then have existed were during the glacial period covered with a greater amount of glacier than now crowns Greenland, and that those mountains

of ice, scratched, eroded, and ground-up masses of *rock*, that then could have been only in a state of transition from the "muddy paste" to their present condition; that in fact, "the "then glaciers, '*judging from their effects*,' were giants in com- "parison with the present dwarfs", whereas, from the then comparative absence of "weight," due to the greater distance of Earth from the Sun, and to her smaller size, the transported matter, whether a mountain of frozen flints or gravel —or boulders with their accompanying "detritus"—or clay, sand, gravel, &c, at a later period of the era, may have been removed and floated by a nominal amount of ice, or none at all And as the flints of the gravel on the tops of the sand-hills were but partially conglomerated or indurated, their then frozen condition will readily account for the detritus or smaller pieces, which separated when the thaw occurred, and from which cause the gravel is but partially stratified

In "Peaks, Passes, and Glaciers," by members of the Alpine Club in Iceland in 1861, it is stated "A great—pro- "bably the greater—part of the vast Vatna Jokull, which is "'supposed to fill a space of not less than 3,000 square "'miles,' consists of these icy plains, and most of the high "mountains in the island have extensive low Jokulls, or ice "plains, around their bases These low Jokulls *are not* "*glaciers*, though the word is often so translated" If the ice of these Jokulls is not the ice of glaciers, what constitutes the difference? And we have read of the formation of ice in India in an excavation at some considerable depth from the surface, where the temperature should be considerably above the freezing-point, and we believe the electrical condition of the earth there at times interferes with the working of the telegraph, whilst the soil in some parts of Russia is frozen several hundred feet deep, obviously not from the cold of the atmosphere or from a downward influence How far, then, does this frozen soil extend, or is it confined to the north, where the earth is full of bones and tusks?

Colonel Webber, in reference to the fantastic arrangement and configuration of groups of boulders, described the Comuti or Taquiari Rock, in about the 5th parallel of S latitude in British Guiana "The Comuti or Taquiari Rocks have received "their name from a remarkable pile of large granitic "boulders, so placed as to resemble a water-jar We ascended

"the mountain, and when we had climbed for some time we "reached the granite piles about 150 feet below the summit "On our left rose the pile, consisting of three huge blocks of "blue granite, the second rested upon the lower one by only "three supporting points, the third block has exactly the "shape of a large jar, and is covered by a fourth, rather flat, "boulder

"A second pile, of pyramidal shape, was on our right, and "is called Kamzi We stood on the third pile, which, by "measurement, I found to be 160 feet high The other two "piles appeared inaccessible, but their height was more than "160 feet

"Another of these picturesque geological phenomena is "named the Devil's Rock, a natural pyramid, on the western "bank of the River Guidara, and is about 900 feet high

"The total absence of organic remains, so far as had been "discovered in 1876—not even a shell, a fragment of fossil "wood, or anything which could indicate the state of the "country at a former period—prevents any decision being "arrived at as to the period when these azoic rocks were "pushed up to the surface"

In Middleton Gorge, in Jamaica also, there are immense boulders 50 feet high or more thrown down and heaped upon each other in the wildest confusion, evidently showing that they were carried there by a rush of water This Gorge has vertical sides 900 feet high, on the top of which other huge boulders are perched, as if arrested at the very moment of toppling over into the Gorge

In "Rude Stone Monuments" there is a map, showing by dotted lines across the sea, the supposed direction of the dolmen builders in their migration South, but if Earth's crust were restored on a globe or otherwise to what it was at that period, it would be seen that, as already stated, the British Isles were then still united to Norway and the North of Germany, and that all the other erections were likewise contiguous, that, in fact, they are in a line of depression, which, yielding to the influence of expansion, produced the separation of Ireland from Scotland and Wales, and Spain from the West of France, all in primary formation, which necessarily offered the least resistance to the depressing influence

The stones of the Dolmens, as we have said, are now of

immense weight, the Carnac Monolith in Brittany weighing 260 tons, but, with less gravitation, they may have had an amount of floatage equal to that now possessed by the lightest of woods, and, if so, man may then have dealt with them in the same way as he would now deal with similar masses of light wood under the same conditions—*i e*, depress them to an upright position and put the large baulk on the top, which necessarily would keep them in that position

It would no doubt be asked how it has happened, if increase of gravitation has so much influenced these stones, that the water itself has not acquired a corresponding increase of weight These stones are composed of sand or other material of a like nature, and in their original condition, when deposited, were merely mud, as testified by the impressions on many of their surfaces, but having in their constitution a property that enabled them to absorb or partake of an electrical condition that gave them great cohesion, with that cohesion they acquired a corresponding amount of gravitation or weight If that cohesion be destroyed, the "dust" has an ascending influence, and is easily carried by the wind even when sufficiently large to be seen without a magnifier Water, on the contrary, as already stated, is little else than electricity, the weight of the gas being quite nominal It has, therefore, within itself the full amount of gravitation, independently of extraneous conditions Man even now is lighter than water, his bones notwithstanding, but whether he could then walk on the waters, or avail himself of the means of flotation, matters not We have assumed that these dolmens were put up after man had availed himself of erratics to keep him out of the mud

We are told by "Homer's Geography" that, about the period of the writer, a vast extent now land was then under water, and, if so, it may reasonably be assumed that at the Dolmen material period there should have been very little land not covered with water, and that as Earth was then swelling to its present dimensions and the ocean and land alternately gained on each other, what could be more reasonable than that the flat stones should be made available for the formation of artificial erratics, and that as man became more numerous or social he should put up a number of stones on end, such as Stonehenge, possibly as a place of idolatry In confirmation of

there being but little land uncovered, as already stated, we refer again to the carvings on perpendicular rocks of the Orinoco, now at a height of 120 feet, it being assumed by the natives that when the carvings were made their ancestors' canoes floated at that height on the waters, and as probably those waters were salt, obviously the amount of vegetation could not have been excessive

The following extracts from "Vestiges of Creation," corroborate the preceding, and seem to show that Earth was much smaller than at present —

"It may be remarked that evidences of the sea having "covered various parts of the earth to a considerable height "are become so familiar that no one now doubts of such a "phenomenon

"But no such submersion could have been total, as in that "case there could not have been that unbroken march of life "of which the crowning results are now presented on the sur- "face of the earth But there may have been, as appears "from marine remains and formations in many situations, a "submergence sufficient to deluge all the land of less than 150 "feet above the level of the sea"

"It, therefore, appears that at a time when the sea was "relatively 2,000 feet higher than at present, six centres of "human population had been established, four of them on "various parts of the Asiatic tableland, one on that of Central "Africa, and another on either the Andean or Mexican table- "land, the phenomena of their subsequent diffusion in the "course of time, while the sea was subsiding and the dry land "enlarging, might have been expected to be precisely what we "have seen"

"It is worthy of especial note that all ethnologists consider "that Europe was colonised from Asia If there had existed "in Europe a language—distinguished variety of mankind, "having no connection with any tableland—it would have been "a serious deduction from the probability of this hypothesis "But Europe being at once a low, therefore a compara- "tively recently exposed region, and one which has notoriously "received its people in successive migrations from the E, is "a relation of facts, obviously favourable to the view here set "forward An important zoological fact perfectly harmonises "with it, that in near connection with the three great table

'lands in question are the three seats of the Quadrumana on "earth—the order of animals, with which the human race is "most in affinity"

Assuming the point of departure of the human family to have been India, since "the lines of human migrations all "converge and are concentrated about the region of Hindustan," that is no reason why Creation should not have been present in a part of the north of the Earth's belt of land—in fact, where the true Post Pliocene is most largely developed on an original formation, or on that soil now constituting a part of England, and from which man was compelled to retreat southwards during, if not before, the boulder and glacial periods. The Post Pliocene, including its vast deposits of loess, is clearly the very last contribution to our Earth, and, as we have already surmised, to that contribution should be confided the germ of the highest order of Creation—the human family

How far the Post Pliocene extends beyond England we are unable to say, but we can unconditionally affirm that the Surrey Hill formation is composed entirely of it It is more largely developed, we are told, at Sevenoaks

"The Encyclopedia Britannica" of 1911 provides the following extract —

"Easter Island, in the Pacific, has wonderful remains of "immense platforms of large cut stones *fitted without cement* "Some of the walls measure 300 ft long by 30 feet wide, built "of stones 6 feet long"

"Immense statues, now thrown from their pedestals, are on "one of the terraces These statues are from 14 to 37 feet "high, and are formed of a grey trachyte lava, found at the "E end of the island The top of the heads of these images "is cut flat to receive round crowns made of a reddish vesicular "tuff found at the crater about eight miles distant from the "quarry where the images were cut A number of these crowns "still lie at the crater ready for removal, and measure 10 feet "across One statue 8 feet high, weighing 4 tons, is in the "British Museum On one part of the island are stone houses "100 feet long, 20 feet wide, built in courses of large flat "stones fitted without cement"

"The lava rocks near the houses are carved into the resem-

"blance of various animals and human faces, forming a kind "of picture writing"

"The only ancient implement found is a stone chisel, but "it seems impossible that such large and numerous works could "have been executed with such a tool The present 100 in- "habitants know nothing of the construction of these works, "and their existence in this small remote island is a mystery"

The explanation of which mystery is that, at the time when these buildings were put up, Easter Island formed part of the coast of Peru, from which it was detached at the break-up of the land (Chapter XI), which probably also destroyed its inhabitants. Clearly also the stones, when set up, were soft, and

FIG 12

Colossal Statues in Easter Island

could easily be fitted without cement and carved with a stone chisel In the orbit our Earth occupied when these buildings were erected there was but little gravitation, as in Mars now, and the inhabitants of Easter Island could move, carry, and erect these large stones or statues as easily as we can now the bricks with which our houses are built

In reference to the above, the following quotation from "Cassell's Magazine" of February 1913, by Camille Flammarion, is of great interest —

"The gravity of Mars at its surface is two and a half times "less than ours, so that if we were there, when we took a step,

"we should cover several yards at one bound, and as the Mar-
"tian atmosphere has more oxygen than our air, if we breathed
"it we should feel extremely alert—be able to cover long dis-
"tances without fatigue"

Owing to the low gravity of Mars, a man who weighs 150 lbs here would weigh only 55 lbs there, and all manual labour would be lightened threefold, so that we should, therefore, be able to lift or carry large stones which we could not attempt to move here

This must evidently have been the case on Earth when the huge pre-historic monuments, at which we now marvel, were erected in what is called the Old Stone Age, or the Paleolithic, and the New Stone Age, or the Neolithic, which together are said to have lasted 600,000 years, during which time, we presume, Earth was in the orbit of the Asteroids or Mars

As the thousands of years passed on, subsequently, men slowly evolved the industrial arts, such as spinning, weaving, pottery, and pile-building, &c Then followed the Metal Ages, in which working in copper, bronze, and iron was developed in the same centres as the Neolithic culture, but iron was unknown in America when discovered by Columbus Architecture advanced, and there were put up such buildings as the Pyramids of Egypt, 4,000 B C, and those at the E of Mexico, which at the period of their erection must have been in close proximity

Of the latter, it is said by A H Keene, F R G S, in reference to the Temple of Mitla "Enormous blocks of immense "bulk and weight have also been placed as lintels over the "doorways, and one marvels how they could be raised to ele-
"vations where it would require all the knowledge of modern
"engineering skill and mechanical appliances to place them"

Notwithstanding all that is said to the contrary, we suspect these buildings were without either cement or mortar at first, and later very little, for the obvious reason that from the then soft nature of the stones mortar could not have been necessary—a remark that equally applies to the temple of Boro Budor at Java, and the reservoir and great mosque of Bajapoor in India, buildings of the most elaborate workmanship, carved possibly with a stick or piece of bone, that completely throw our pigmy imitations into the shade. The intense hardness of the concrete and mortar of our monasteries is evidence

of a very slow hardening process, and the information we require to complete our history of this truly interesting period is the epoch when a cement was first used, and the nature of the stone to which that cement was necessary to combine its surface

It would appear that when the later buildings were erected, such as the Pyramids, Earth had reached an orbit in which the weight of the stones used in building had much increased The hieroglyphics and pictures still existing in ancient Egyptian buildings show that an enormous number of slaves was harnessed to the immense blocks of stone, some 70 ft long, which they dragged along from the quarries and raised to the requisite height for the buildings by extemporised inclined planes, but it seems unlikely that such mechanical contrivances were used in the erection of the Neolithic buildings some hundreds of thousands of years earlier

A little cement was used in building the tomb of Osiris, of which it is said "During last winter, 1913, the excavations "in Egypt have unearthed Strabo's well and the tomb of "Osiris Some of the slabs, or rather blocks of granite, in "this latter building are more than 6 feet thick and weigh "more than 30 tons each The enclosure wall is 20 feet thick, "built of limestone and of beautiful hard, red quartzite"

"The joints are very fine, and there is only a very thin, "hardly perceptible, stratum of mortar between the blocks"

This period must have been long after the cave excavations of Egypt and India, which excavations, we surmise, were in "Mediterranean" limestone It is desirable also to determine when foundations were first introduced The gigantic monuments to the great men of some land, whether of Peru or Burmah, now *covering* Easter Island, so far as we have been able to learn, are without foundations, and if the iron column at Delhi ever had a foundation, it must have been very inefficient Possibly future generations, *as gravitation increases*, may have something to say about the insufficiency of our foundations, although possibly in our case the demolition will be from loss of cohesion in the rocks or materials from increasing negative state of the earth Electricity, be it borne in mind, blows hot and cold And although the stones forming the Dolmens were floated to their present position, those of the buildings were quarried or cut out

It is on the line of depression, or possibly on the Secondary and Tertiary formations, that civilisation has taken root, the white races being on that line and the coloured outside it England, when the earth was one entire mass, as already stated, was in the North, and, if we mistake not, in the centre of the line of depression, but her exact relative position will be apparent only when Earth's crust shall have been restored on a map to what it was before expansion took place

EARTH IN THE ORBIT OF MARS.

CHAPTER XI

Rocks drawn up from below—Effects of oxygen atmosphere—The Mediterranean, Black, and Caspian Seas how formed—Land begins to break up—Magnetism—Rocks acquire electricity and weight—Volcanic action—Alteration of Earth's angle of inclination—Great Britain and Ireland separated from the Continent—The Alps, Urals, and Pyrenees formed after the break-up of the land—The Rocky and Andes formed before this event proof, the Isthmus of Panama Canal—Slides in this Canal—Crystallisation of rocks—Examples of expansion, by General Drayson and Mrs Somerville—Raised beaches, deep valleys, gorges, and cañons, the result of expansion—Extract from Colonel Webber's visit to British Guiana—Picture writings

On the surface in many different parts of the earth there are gigantic masses of granite and other rocks, which, as already observed, are supposed to have come from below These, where they have not been much disturbed, as in many of the headlands of Cornwall and Devon, are in regular layers or blocks Of granite, we are told "that it may be considered "a lower portion of the immediate crust of the earth, which "has been liquefied and forced to the surface at various "epochs, but *has not been erupted*"

The next rocks of greater density are the Trachytes, which are "sometimes covered by Tertiary strata, *but never by the "Secondary or older strata*, and it has, therefore, been assumed "that the epoch of their appearance is that of the earlier "Tertiaries", and of basalt, it is said "the reasoning already "applied to granite, together with the fact of its penetration "by basalt, leaves no doubt that the latter *has come from "depths below the granite*", and it is further said, "as the "basalt was posterior to the trachytes, so the true lavas have "been erupted subsequently to the basalt"

Here, then, is evidence that the "eruptive force" in all cases of eruption, whatever it may have been, *was from above and not from below*, since, had it been upheaving, the lava, basalt, trachytes, and granite must have been pushed up to-

gether, but, on the contrary, we are first told "of a gentle "raising force that increased as the earth crust thickened, "which pushed the granite *through* the softer materials of "Earth's crust (which the geologist designates metamorphic "rocks), without throwing out dykes, either cutting through the "strata or filling up cracks produced by fracture in them, "then the *lifting force* that brought up trachytes, and basalt, "and at a much later period, mountains of minerals and other "'volcanic' matter", and the "general form of the earth has "been altered from its original condition, not by one but by "many commotions, *increasing in intensity on approaching exist-* "*ing epochs*, and as the thickness of the *solidified crust has* "*continued to increase*, the most recent chains of mountains "(such as the Alps, the Himalayas, &c) are *necessarily* the "most elevated"

It will be allowed that matter in a more highly negative state must be acted on with a force proportionate to the difference of electrical condition

Metals, then, in a gaseous state must clearly be in this condition Thus, when the oxygen atmosphere prevailed, the effect could have been no other than that of which such ample evidence is afforded in all mountainous districts—*i e*, the raising of this matter through those parts of the globe which offered the least resistance, and afforded the most ready passage for the electrical influence of the oxygen, or of the upper regions, on the heated matter below the crust

There are certain properties in matter which, however well defined, we do not yet clearly comprehend Water is a good conductor of electricity, but a very bad conductor of those electrical conditions understood by "heat" and "cold"—a property doubtless imparted to it for some wise purpose

Therefore, during the oxygen period, all those portions of the globe covered by that fluid were securely protected from this electrical influence Most matter is a good conductor in proportion to its hardness or compact nature, although it would naturally offer an amount of resistance equal to the bulk Those parts of the liquid mass of the globe, therefore, most subjected to the electrical influence of the atmosphere of this period were those most acted on, and it being essential that the supply should be equal to the demand, the boundaries or margin of the continents supplied both requisites—first, by

presenting the least resistance, and, secondly, by the depressing influence of the ocean on its soft bed, filling up the vacuum as fast as it was formed—the Mediterranean, Black, Caspian, and other inland seas, we conceive, being referable to the mountainous districts by which they are surrounded

The uplifting of the Earth and creation of vast ponderous masses in different parts, together with the extraction from beneath of a corresponding amount of the liquid foundation, could not fail in producing extensive cracks, and at the time that these were formed another disturbing cause came into operation—*i e*, magnetism

It is evident that there was no magnetism in the early forming orbits, which are too hot for its operation to take place, it being well known that minerals and metals which are capable of being magnetised absorb magnetism in an inverse ratio to the heat they possess, so that if magnetised when cold and then heated the magnetism decreases until, when they are red-hot, they possess none, if allowed to cool, they regain this property in proportion as their temperature is lowered

When Earth entered the latter half of Mars' orbit, gravitation became more powerful, and that which was floating matter before became depressed beneath the waters as gravitation increased—that is to say, that the rocks in their then incipient state acquired electricity from the air, and gradually became harder and heavier than the ocean, which, as already explained, is little else than electricity

It would appear, then, as we have long surmised, terrestrial magnetism is merely an effect produced by the combined influences of Earth's inclination to the Sun, a sufficiently rapid rotation of the planet, and an electrical medium Professor D E Hughes, F R S, in a highly-interesting paper, read to the Royal Society in May 1881, on molecular magnetism produced by electricity in iron wire, concludes with the observation 'I desire simply to draw attention to the effects that molecular action can produce in its relations to electricity and magnetism, and it seems to me that a knowledge of the molecular action taking place is a necessary step previous to knowing what magnetism is in itself"

Professor Hughes, so far as we are aware, is the first scientific authority who has cast a doubt on the reality of magnetism, nor does it clearly appear in what way "molecular

action" can produce effects, since that action is itself produced by the influence of electricity on iron wire, *a bad conductor*, and no similar effect is observable on a good conductor, such as copper wire

Whether an electric current be made to flow around a bar of iron, or the bar be made to revolve in an electric atmosphere, the effect is the same—the bar is thrown into a magnetic condition

When, therefore, the atmosphere raised portions of earth, it also imparted to them magnetic condition, which drew towards its positive pole the metalliferous matter as formed two causes—the cracking and magnetic condition, that could not fail in commencing to break up into a multitude of pieces the land which, up to this time, had remained in one mass, with the rocks not yet quite hardened nor crystallised

At this period another factor came into operation—*i e*, the volcanic era which, when in its most violent stage, caused the ejection from Earth's surface of the masses of land forming our Moon, but this will be considered in Chapter XII

Such an enormous ejection of matter must have disturbed the whole of Earth's land, completing by broad cracks its break-up into its present continents and islands, &c, and also would be quite sufficient to upset her angle of inclination, which changed suddenly from 28°, or perhaps more, to the present angle of $23\frac{1}{2}°$

This was not Earth's first change of angle, nor do we think it will be her last No two planets have exactly the same angle of inclination, and Earth no doubt changed hers according to the orbit she was occupying

We showed in Chapter VII that on entering the orbit of the Asteroids she changed her angle of inclination of about 2° to 28° (or perhaps more), and this change of angle increasing in degrees had the effect of sending the whole of the land in one mass towards the north, where it remained all the time Earth was revolving in the Asteroid orbit, contracting in diameter, acquiring the Tertiaries, and receiving the most advanced forms of life

We presume that Earth retained this angle of inclination of 28° or so until she was half-way through the orbit of Mars

As the former change to a greater angle from 2° to $28\frac{1}{2}°$ sent the land far northwards, the latter change of angle, being

on the decrease, from $28\frac{1}{2}^{\circ}$ to $23\frac{1}{2}^{\circ}$, would appear to have had a contrary effect, sending the land southwards to its present latitude, the islands which North America, Europe, and Asia left behind them showing the direction they had come from, whilst no other operation than the pull of Australia, as it assumed its present position, could have produced the islands to its north from Siam to New Guinea

Great Britain was once united on the West to Ireland and on the East to Norway, and at the present day many well-known Norwegian rocks litter our Eastern Counties The land of the North and West of Norway is fiorded or broken up into deep bays and small islands, indicating that before separation it had been subjected to an unusual amount of pressure and strain, whilst Africa, which must have been the centre of the land before the latter broke up, has scarcely a bay

It appears that Great Britain and Ireland, no doubt for some wise purpose, took a central insular position, the deep chasm or gorge formed when they separated from France and the West of Scandinavia being a guarantee that they shall never again form part of the continent, notwithstanding all that is said to the contrary about forming a tunnel under the English Channel

In support of our theory that North America, Europe, and Asia were closely grouped around the North Pole, there is the fact that the Esquimaux, Lapps, Finns, and Northern Siberians are all of the same race, and have many customs, &c, in common, which would not be the case if these continents had always occupied their present relative positions

Although these changes must have taken place within comparatively recent times, when, in fact, man destroyed his fellow-man agreeably to the rules of warfare, and when South America parted company with Africa (hence the story of the Atlantis), still, it is conclusively evident that these movements preceded the formation of the more recent mountains, the Alps, Urals, and Pyrenees, and other mountains of that date, seeing that these now unite the pieces of land which were displaced by these changes, such as Spain, the north of which was attached to the West of France, so that Cap Ortegal, Cap Finisterre, and the Land's End were all contiguous when, as already observed, the Dolmens of these districts were erected, and it is a fact that the same race—the Mediterranean—peopled the

West of Spain, and of France, Cornwall, Wales, Ireland, and Scotland

It is equally evident that the Rocky and Andes Mountains were formed *before* these movements of the land took place, since they were broken apart at the Isthmus of Panama, when Central America was torn away from the N W corner of South America, and the latter and Africa were separated from North America and Europe, South America taking a northern direction.

Agreeably to a paper read at a meeting of the Royal Geographical Society in January 1859, it was stated "Lake Zojan "occupies the centre of one of those singular terrestrial basins "of which Honduras offers many examples, which are formed "by the contortions of the mountain system of the country, "*the ranges of which frequently bend back on themselves*, some- "times describing almost circles and enclosing plains of vary- "ing extent and heights," which, *bending back on themselves*, could have been produced in no other way than by the joint action of the separation of North from South America, and the movement of the latter on taking the magnetic North direction, and as the toe of the foot or boot constituting the Isthmus of Panama came out of the Gulf of Guayaquil, in Ecuador, and the union to the strip of land of South America has since been effected, neither of those soils could then have been in a hard or crystallised state, else this "bending back on themselves" would have been impossible to the mountain ranges A canal has been cut through this isthmus, and to the surprise of all concerned, the under soil, instead of being hard rock, is nothing but earth and mud, which has caused numerous landslides of millions of cubic yards of clay or soft earth, which have slipped into the canal, presenting a most difficult problem for the engineer to cope with

[*Note*—One of these landslides has only just been remedied, after the canal had been closed eight months—ED]

The presence of the soft earth and clay is proof of a definite break in the continuous line of the Rocky and Andes ranges, the rock of the top and the under earth being the union of the rock of the gulf and earth of the N.W corner of South America

The following extracts from "The Graphic," October 11, 1923, endorse the preceding statements —

"The Culebra Cut has been the greatest problem in the "construction of the Panama Canal, as every now and then, "owing to the treacherous nature of the underlying strata, a "gigantic landslide took place, and a few million cubic yards "of clay or soft earth slipped down into the Canal prism "The slides, indeed, have been responsible for about a fourth "of the material excavated by the United States—as Culebra "Slide, 1912—involving the removal of 9,500,000 cubic yards "of clay"

"The Cucarachia Slide, 1907, involving 3,000,000 cubic "yards of clay"

"In another Slide, 50 feet of earth were forced up and "out from beneath the clay"

From "The Daily Graphic," January 6, 1915 "Panama "Canal is to be closed, probably till the spring, on account "of the earth slides which have taken place recently in it"

[*Note*—When "De Lesseps" Canal was first started my father wrote to the promoters stating that the Canal would be a difficult undertaking, as they would find a break in the continuous chain of the Rocky and Andes Mountains He died before the present Canal was completed, but the break between North and South America is a fact, and is a proof that his theory of the break-up of the land is the correct one In "The English Mechanic" of August 4, 1916, it is stated that "engineers now think the Panama Canal will have to be aban-"doned, owing to the land-slides which are continually taking "place"—Ed]

The reader must bear in mind that all through the events which we have treated so far the rocks and minerals of Earth were not completely hardened nor crystallised as we see them now

When the great statues and buildings which we have already mentioned were put up, it is evident that the rocks or stones which were used were soft enough to be worked or carved with very elementary tools, but they were also firm enough to be used in the erection of great temples, &c

The atmosphere in the orbit of Mars, although not so hot as in Jupiter's, must be too negative to form ice even in the

depth of Mars winter, but matter by compression becomes electrical, and electricity is the cause of crystallisation If a flask of water be surrounded by silk in a very cold atmosphere, the water will descend several degrees below the freezing-point without crystallisation, but which takes place instantaneously with vibration or on the water being touched The earth-belt in Jupiter, by rotation and distance from the Sun, is positive, a condition that would necessarily increase in proportion to the compression to which the matter or rocks of Earth's belt as a crust became subjected in the orbit of Mars, where the contraction of the planet reached its maximum

As intense pressure or contraction produces intense cold, and even the crystallisation of carbon to the production of the diamond, we assume that the crystallisation of our rocks and minerals was not completed till Earth had undergone the maximum of compression in the orbit of Mars

When Earth's sudden change of angle from $28\frac{1}{2}^{\circ}$ to $23\frac{1}{2}^{\circ}$ occurred, the ensuing vibration would cause all her rocks to crystallise instantaneously

As to the period when this change of angle occurred, the following remark in "From Central and South America," by A H Keene, F R G S," gives us an idea —

"All *Asiatic* influences in the evolution of *American* cul-"tures were arrested at the Stone Age, after which the cultiva-"tion of the New World proceeded on independent lines of "development"

This quotation seems to assert that Asia and the Americas had been in communication, but became separated during the Stone Age We will now proceed to consider the expansion of Earth

In reference to this subject, we find the following in "The Earth We Inhabit," by the late General Drayson —

"If the Earth has increased in size, it is natural to con-"clude that countries which are now separated by seas once "joined each other, and there should be similarity in the geo-"logical strata of these continents"

At pages 58 and 59 of "Physical Geography," by Mrs Somerville, we find —

"It seems to bear upon the subject that parallel mountain

"chains are similar in geological age even when separated by "seas, for the mountains of Sweden and Finland are of the "same structure, though the Gulf of Bothnia is between them, "those of Cornwall and Brittany and the N W of Spain are "similar, the Atlas and the Spanish Mountains, the chains in "California, and those on the adjacent coast of America, "those of New Guinea and the N E of Australia, the chalk "cliffs on the opposite sides of the English Channel show that "Britain once formed part of the continent, the formation "of the Orkney Isles and Iceland is the same as that of the "Highlands of Scotland, the formation is the same on both "sides of the Straits of Gibraltar and in many other Straits, "that of Turkey in Europe passes into Asia Minor, the Crimea "into the Caucasus, and Behring's Straits divide the ancient "strata of a similar age"

Mr Hopkins, of Cambridge, has taken a purely mathematical view of the subject, and has proved that when an internal expansive force acts upwards upon a single point in the Earth's crust the splits or cracks must all diverge from that point like radii in a circle, which is exactly the case in volcanic and earthquake districts, but when the expansive force acts uniformly from below upon a wide surface or area, it tends to stretch the surface, so that it would split or crack where the tension is greatest—that is, either in the direction of the length or breadth, and if the area yields in more places than one he found that the fissures would necessarily be parallel to one another, which agrees with the law of arrangement of veins in mines"

General Drayson goes on to point out that the expansion which Earth underwent would be a steady, slow and gradual increase which agrees with our own idea of Earth's growth when passing through the orbit of Mars into our present one

Geologists do not confine denudation to the mere rounding of angles or tops of rocks, but actually apply it to the formation of valleys and gorges of some hundreds or thousands of feet deep in the hardest of rocks, but the reader has no doubt observed how clay cracks by contraction when drying

We read in "Mountains and Forests of South America," by Paul Fountain, p 154 "If we take a handful of clay and "press it in the hands in the form of a ball, and then examine

"its surface through a magnifying glass, it will present to the "eye exactly the same fissures and irregularities on a minute "scale that we find on the surface of this globe of ours "Generally all these great fissures in the mountains of the "Ecuador Andes are merely cracks on a vast scale Few of "them are water-worn or cut by streams, and if they now "have rivulets at the bottom of the crevasses the water has "found its way thither since the formation of the abysses and "was not the original cause of them These clefts are merely "enormous cracks in the solid rock, which has fallen apart "or been rent asunder by some tremendous and fearful con-"vulsion of Nature *Projections on one side of the abyss had "invariably recesses immediately opposite to them in the opposing "wall, and vice versâ*"

As Earth, after the drying, compressing, and solidifying of the crust, perhaps, expanded from about 4,200 miles to nearly 8,000 miles in diameter, the cause of all these effects is readily accounted for

Of tablelands, &c, we are told by John Mactuik, F R G S, in his "Physical Geography" —

"The valleys of tablelands are generally deep clefts or "gorges cutting abruptly the mountains or plateaus they tra-"verse Their sides are precipitous, *although often miles "apart* The scenery is often very grand and striking, and "they interfere materially with communication between the "opposite banks Such are the river-valleys of Spain, the "course of the Zambesi in South Central Africa, the Cañons "of the Rio Colorado in North America, and the plains of "Western Thibet"

As these clefts and gorges abruptly cut the mountains they traverse and have precipitous sides they are clearly not of water formation but must be due to the expansion of Earth

If we inflate an indiarubber ball to nearly one-half its normal diameter, then cover the surface with a coating of wet clay, when nearly dry it may be taken to represent Earth in the early part of the orbit of Mars Now slightly continue the inflation, and what will happen?

The clay surface will be too small, and cracks will appear all over it Continue the inflation till the ball is its normal size, and we shall have to call these widened cracks oceans,

seas, gulfs, cañons, &c, and the divided pieces of clay continents, such as North and South America, Africa, &c

A constant enlarging of the globe would necessarily increase the cracks or breaks made by the depressions and risings, and the two Americas, gradually separating from Europe and Africa on the one side, forming the Atlantic, and from Asia on the other side, forming the Pacific, would, we need scarcely state, cause a decrease of the waters elsewhere and on the coast-lines of those oceans This enlargement is chronicled, as already observed, by what is termed raised beaches, but to the *raising* of which the persistent parallel of miles in extent is fatal evidence

Of the raised beaches we are told "that movements have "affected different parts of the earth in such a slow and quiet "manner as not to be perceptible at the time, but to be capable "of detection by their effects at the margin of the land" Of terraces of sand and gravel, "many such terraces skirt the shores "of Great Britain They form a marked feature of the coast "in the north of Norway On the western margin of South "America they occur in great perfection, reaching sometimes "a height of 1,300 feet above the sea, where sea-shells still in "position attest the amount of uprise Spitsbergen is fringed "with raised beaches up to a height of 147 feet The coast-"line of Northern Russia and Siberia for hundreds of miles "has been recently elevated out of the sea It would appear, "indeed, that the Tundras and Steppes upheavals which stretch "from the Arctic Ocean to the Sea of Aral and the Caspian "and Black Seas are only an upraised sea bottom" At no distant date, therefore, the sea must have come far south, dividing Northern, Central, and South-Western Asia from Europe "The shores of the Mediterranean afford local illus-"trations of uprise, while the great sandy desert of Sahara, "containing here and there scattered sea shells up to a height "of 900 feet, is a case of a recent elevation of a wide tract "of sea bottom"

Let us suppose, on the contrary, that before the break-up of our Earth's land between the highlands there should have been a depth of water proportional to the depression, and that, after the separation of the land, as Earth expanded this water was lowered as the oceans formed, leaving evidence of the

former positions of the water's surface These beaches would then be on a perfect level, and the distances in height between them would give some indication of the extent of the periodical separation of the land to the formation and extension of the oceans, seas, and lakes

The Arctic Ocean is shallow, and the number of islands to the north of North America implies the grounding of that part of the land, a similar remark applying to Australia, so that when expansion came into operation Australia and the islands between it and Asia became separated by it, the direction of the expansion being evidently governed by the absence of resistance, due to the nature of the rocks, and to some extent also by latitude

The following extracts from geological notes from a visit to the Kaieteur Falls, in British Guiana, by Colonel Webber, bear us out —

"The general impression produced by an examination of "the country is that here we see the last stage of a process "that had been going on during the whole period of the ele- "vation of the Andes and the mountains of Brazil and Guiana "At the commencement of this period the greater part of the "valleys of the Amazon and the Orinoco, as well as La Plata, "*must have formed parts of the Atlantic Ocean*, separating the "elevated lands into groups of islands"

"The savannahs of British Guiana are composed of the "disintegration of the rocks with the admixture of vegetable "matter The great savannahs of the Rapunum are encom- "passed by mountains N, S, E, and W, occupying about "14,000 square miles"

"The geological structure of this region leaves but little "doubt that it was once the head of an inland lake, which "by one of those catastrophes not unfamiliar in later times, "burst its barrier and forced its way into the Atlantic"

"The theory of the valleys and plains having been at one "time inland lakes seems to derive some strength from the "Indian traditions relative to the singular relics of a past "occupation by tribes of whom no other traces remain, known "as 'picture writings,' which have been mentioned by various "travellers"

"On the Sierras of Montealegre the designs are painted or "rubbed in with a red-coloured pigment high up on the moun-

"tain and not near any river now Schomburgh says he traced "such inscriptions here and there over an area of 350,000 "square miles, and they extend far beyond that limit."

"They must be very ancient, as existing Indians know 'nothing of them They say they were made by the Good "Spirit, or by their forefathers, who used to go there in boats "to those heights long ago"

"The subjects are various outlines of birds and animals, "men and women, full moons and large sketches of vessels "with masts They seem to represent writing, and bear some "resemblance to the characters of Semitic alphabets"

Assuming that when these picture writings were made our Earth had not more water than at the present day, the high level then of the water over such a large area can only be explained by one of two facts—*i e*, either that the land was sunk deeper than now or that our Earth was much smaller than at present, and we think the latter conclusion is the right one, borne out as it is by the evidence of the squeezed-up state of the rocks as shown in the extracts we have given from well-known geologists

EARTH IN THE ORBIT OF MARS.

CHAPTER XII

Moons of the early forming orbits—Each orbit produces certain changes in the planets occupying it, the general conditions of each orbit being always the same—Our Moon, and her origin—How formed, if ejected from Earth by volcanic agency—Our atmosphere contains more electricity the higher we ascend in it—Our tides—Intimate connexion between the Sun and Earth—Total eclipse of the Sun—His corona, constitution, and power—Light—Planets and fixed stars

It is noticeable that the planets in the early or forming orbits possess more moons than those which revolve nearer the Sun in the later ones Neptune has 1 or 2, Uranus 8, Saturn 10, and Jupiter 8, but in 1862 Saturn had only 6 and Jupiter 4

We presume that each orbit produces certain changes and conditions in the planet occupying it, so that each planet as it progresses towards the Sun resembles, in general conditions, those which preceded it in the orbit in which it is revolving, the conditions of each orbit always being the same, distance from the Sun being the ruling influence which produces differences in the several orbits

We assume, then, that when Earth was revolving in the early orbits she also had several satellites, some of which may have accompanied her through more than one orbit

It is not impossible that Australia may have been one of these which fell upon Earth in the Asteroid orbit, and this idea is borne out by her flora and fauna, which are peculiar to her

The Asteroid orbit is the last of the forming periods and of contraction, the orbit of Mars being that of contraction and of expansion of the planet in that orbit

If Earth did not bring our Moon with her as a satellite from the earlier orbits, and she received no forming matter from the orbit of Mars, obviously she must have supplied her by ejection during the volcanic era, of which there is ample evidence on Earth's surface, as proved by the large number of extinct volcanoes, from which vast quantities of matter must have been ejected in past ages

It would be in vain to hazard a conjecture as to which part of Earth supplied our Moon, unless she came out of the land which occupied the Pacific Ocean

The orbit of Mars, or the mean distance of his orbit, is about 144 millions of miles from the Sun In the time of Herschel Mars had not passed the centre of his orbit, nor was he known to possess any moons, until shortly after the middle of the 19th century, when two scraps were discovered, ejected probably from his surface

Reasoning on the assumption that when Earth was in the centre of the orbit of Mars she resembled that planet, it may reasonably be assumed that our Moon was ejected from Earth when the latter was at about 144 millions of miles from the Sun, the period of her smallest dimensions, in fact, during the "volcanic era," and, if so, our Moon is made up of a number of small ones, ejected separately, such as those now revolving around Mars

It may be asked, How were they combined into one?

It may be borne in mind that our planet, being then much smaller and at the distance of 144 millions of miles from the Sun, had very little weight on her surface

Assuming that the matter that insulated the Primary formations from the nucleus was of less density than air when ejected from Earth at that distance from the Sun, the then nominal gravitation would have very little influence on it, but as Earth approached our present orbit, the combined action of the negative interior of the planet and the more electrical orbit would cause the several globes or moons to recede from the planet Electricity is the cause of affinity or combination, and this being present in space would cause the globes to combine when they had receded beyond the bounds of our atmosphere, the heat or negative condition produced by the combination being sufficient to account for the force, whether attraction or repulsion, that gave to our Moon its present distance of about a quarter of a million of miles from us These small moons, when combined into one mass, such as our Moon, would necessarily have the appearance of "craters," which now have their respective names, and are watched and scrutinised with telescopes to detect any change that may take place in them

The reader may ask "How do you know that when the

"small moons receded from Earth they met with enough elec-
"tricity to cause them to combine into one?"

Because, as we stated earlier, all incandescent bodies are surrounded by an atmosphere which is electrical in proportion to their incandescence, and the Sun's electrical influence extends beyond the limits of our Solar System

Also, as we have already stated, Messrs Crosse and Weekes, by their researches with electrical kites, demonstrated that from a clear sky there always descended streams of electricity, and, furthermore, that *the electrical condition increased with distance from Earth*, the negative condition of Earth no doubt causing a diminution of electricity in the atmosphere surrounding her

And what is the cause of the Moon's influence on our ocean to the production of tides? All spherical bodies revolving around the Sun should have a rotary motion, which the Moon has not, and if she be a flattened disc of the thickness of about 250 miles, or of the diameter of the bodies now revolving around Mars, her attraction on our waters cannot be what that word implies mathematically but must be electrical by the reflection of the dark rays of the Sun When she was ejected from Earth the atmosphere of the latter at 144 millions of miles from the Sun must have been highly negative or hot, compared to what it is now, whilst the earth must have been correspondingly positive or electric, and the Moon's influence must have been relatively smaller In the present change of conditions in these latitudes—*i e*, an electrical atmosphere and a negative earth—both the Moon's light and attraction must have increased in proportion to the change, and will continue to increase with our approach to the Sun, so that objects on her surface will become more distinct, and unless there should be a corresponding decrease in the ocean our tides will become gradually higher In fact, all changes will have a levelling influence, perhaps socially as well as physically loss of cohesion in our rocks—with landslips and floods—cross-seas—higher tides and winds, and other disagreeables of increasing old age

That in the above hypothesis of the Moon's influence on our waters there may be apparent deficiencies must be allowed, but, at the worst, there is nothing of the impossible, such as "the Earth *being drawn to the Moon*, so as to leave the mobile "waters on the opposite side of the globe behind, hence causing

"them to bulge out to an equal extent with those on the other "side"

In reference to what is known as *spectrum analysis*, it is said that the Sun contains a large number of elements, including hydrogen, sodium, lithium, calcium, barium, magnesium, zinc, iron, manganese, nickel, cobalt, chromium, aluminium, and copper, all which metals without a question belong to the planets, but, we contend, never did form part of the Sun, although without a doubt they are being constantly supplied to his atmosphere, the difference of opinion between the scientific world and ourselves being in the interpretation of the fact To avoid all possibility of error on our part we shall continue our quotations —

"When a beam of sunshine is allowed to pass through a "small aperture in the wall of a dark chamber, and then to traverse a three-sided glass prism, like the drop of a lustre, "it does not fall as a spot of white light, but is turned aside "from its course and spread out into a broad band, which "presents all the colours of the rainbow This coloured band "is called a *spectrum*"

"On closely examining the spectrum of the Sun, which has "thus been formed, through a narrow slit, it is found to be "crossed by a multitude of fine dark lines, which are, indeed, "so many spaces in the bright band A spectrum obtained "from an ordinary gas flame or from the electric light differs "from the solar spectrum by being destitute of these dark "lines, the light of the flame being unbroken from end to "end But if certain gases or vapours, such as hydrogen or "sodium-vapour, be burnt in the path of the artificial light, "lines are immediately produced in the spectrum If the tem- "perature of the substance which produces the lines be lower "than that of the substance which gives the continuous spec- "trum, the lines will appear dark, if the temperature be higher, "the lines appear bright Lines produced in this way have a "definite position in the spectrum, so that the same chemical "elements under the same circumstances always give the same "set of lines It is plain, therefore, that by observing the "position of the lines in the solar spectrum and comparing "them with the lines which are produced by the combustion "of various terrestrial elements, the presence or absence of "such elements in the Sun may be inferred"

Soon after the discovery of the telescope it was directed to the Solar disc, and it was then found, in the beginning of the 17th century, that the Sun's face, instead of being uniformly bright, is usually spotted with patches which appear dark, inasmuch as they are less luminous than the intensely bright surface which surrounds them that those spots are not constant either in shape or in position, sometimes, indeed, though but rarely, they are altogether absent If the spots are watched day by day they may be seen to march slowly across the disc, *all moving in the same direction*, showing that the Sun takes about twenty-five days to rotate on his axis

"The intensely luminous part of the Sun, which is the seat "of the spots, is called the *photosphere* It appears to con- "sist of incandescent cloudlike matter which is subject to "violent disturbance, whereby depressions are produced into "which the solar atmosphere rushes from higher regions The "rapid changes in the shape of certain Sun spots indicate the "violence of this action Some of the spots are so large as "to occupy millions of square miles of the Sun's surface"

"There is, then, a fringed lightish margin called the "*penumbra*, whilst a darker shade represents the *umbra*, and "within the umbra itself there may sometimes be detected a "yet darker part which is called the *nucleus* There is reason "to believe that these spots are nothing but gigantic cavities, "and that differences of shade correspond to differences of "depth, the nucleus thus representing the most profound part "of the hollows"

Obviously the Sun's intensity of luminosity can be required only where the planets travel in their wanderings within what may be considered the Sun's tropics And we may be allowed to venture so far as to suggest whether the occasional appearance and disappearance of stars may not be referable to change of inclination in the stars so appearing and disappearing or undergoing any other change

Of the enormous amount of heat and light thrown off from the surface of the Sun, it has been calculated that of that light and heat we receive less than the two-thousand millionth part of the total so thrown off That the Sun is not only the principal source of heat and light to our Earth, but is the source of attraction by which the revolving globe is main-

tained in its regular orbit Whereas it is conclusively evident that if the heat and light we receive came direct from the Sun, the dark lines already referred to in the Sun's "rays" could not be there, whilst if those rays be original, their affording light and heat by chemical action is at least within the bounds of probability And so far from our being retained within our orbit, our proximity to the Sun is becoming more evident than agreeable The "heat" of the winter 1885-6 was anything but oppressive, whilst haymaking, that under the most favourable circumstances seventy years ago occupied at least five days of constant turning over, is now accomplished in thirty hours, if not in less time in dry weather

During a total solar eclipse, when the Sun is obscured by the Moon, there is seen around the disc a "glory" or fringe of radiant light, which is called the corona, from which start fantastically-shaped tongues of red flame, 164,000 miles long or more, which are said to consist chiefly of hydrogen, all of course emanating from the Sun Above the region of incandescent hydrogen there appears to be an enormous envelope of the same gas in a comparatively cool state

If, as we have assumed, our Earth's crust was compounded during her journey through the several early forming orbits, we may reasonably assume that as all those orbits must be full of matter to produce such enormous masses as those constituting our various rocks, no light from stars or planets could then have reached Earth, and evidently the decomposition of those rocks in the minor planets in these orbits between us and the Sun cannot otherwise than affect his rays And when we bear in mind that all these operations take place outside our atmosphere the hydrogen tongues of red flame seen during an eclipse of the Sun should in no wise surprise us—the chromosphere, or enormous envelope, "in a comparatively cool state" being, we conceive, the Sun's atmosphere—*i.e.*, concentrated electricity, which the darkness of the Moon renders visible during an eclipse

To pass from the eclipse of the Sun to the consideration of his constitution, we must not lose sight of the fact that he not only governs all the movements of the Solar System but actually supplies all the elements for the formation of the several planets, not from himself, but by the decomposition of the used-up materials in much the same way as we under-

stand "Nature" to be the grand restorer Also the Sun is 750 times as massive as all the planets combined, and contains much the greater part of the materials composing the Solar System

It is very certain that there is a most intimate connexion between the Sun and Earth, and also that electricity is concerned in the matter in some way or other, as the following from "Chambers' Astronomy," 1912, proves —

"In September 1859 two English observers, in different "places, were noting Sun-spots from which two patches of "bright light burst forth at 11 18 a m Simultaneously there "occurred a great disturbance of the magnetic instruments at "Kew Observatory, followed, sixteen hours later, by a violent "magnetic storm, during which telegraphs were interrupted "and auroia appeared This incident does not stand alone, "for on several more recent occasions large Sun-spots and "marked disturbance of instruments recording terrestrial mag- "netism have been noticed as contemporaneous events"

Our atmosphere retains only a certain amount of carbonic acid, whatever may be the quantity discharged into it It is not improbable, then, that a similar condition may obtain with the Sun's atmosphere, the surplus quantity of the gases of metals, &c, being rejected to the several orbits where they are required; and if this be the case, it is possible that the Sun's "rays" (the electricity we are constantly receiving) should be charged with the several metals demonstrated by the prism, which metals do not actually form part of our luminary

Platinum, the most dense of our metals, we must consider to be the lightest of those metals, the gases of which are at Earth's centre (the gases of our original comet), and whatever may be their density or densities they can be as nothing compared to the densities of those constituting the Sun, since as that body governs the action and formation of the planets he must be of a vastly greater density than they are—in fact, proportional to the power he possesses

During hot sultry weather there is seen over roads and other dry earth a wavy appearance vulgarly ascribed to heat, and a similar undulation surrounds bars of iron at a white heat and is very conspicuous in a wind furnace, when only charcoal and coke are burned If, then, man can produce

such an effect, it can in no way excite surprise if actual waves should be seen floating over the Sun's disc, since there the electrical atmosphere must be in a highly dense state No doubt the protuberances are accumulations of this incomprehensible and all-pervading agent, whilst nothing but such masses of electricity could give the amount of light we receive from the Sun, the more especially as we face only a portion of his disc at a time

Light, we are told, travels at the rate of 186,000 miles in a second, the reflections from one of Jupiter's moons, when that planet is farthest from or nearest to us, being the groundwork of the calculation, and on the difference of time it takes to reach us, it is assumed that the light from some of the fixed stars must take so many thousand or more years to come to Earth But assuming space to be a void, or darkness, the light becomes evident only when the rays from a luminary impinge on our atmosphere The space, however, of the Sun's outer atmosphere or of the Solar System is the very opposite to a void, and evidently the amount of obstruction to the travelling of reflected light in it must be proportional to distance We know how long a spark takes to encircle Earth through a copper wire, but we know not what would be the time were there no obstructions, whilst in transmitted and reflected light there may be a vast difference

Planets can readily be distinguished from fixed stars, there being in the fixed stars, to the naked eye, a "twinkling" which most of the planets have not, and which twinkling, flickering, or flashing is not very dissimilar from the appearances that attend a total eclipse of the Sun Shortly after sunset the planets make their appearance, and shine with considerable brilliancy—in fact, to their full splendour—for some time before stars of even the first magnitude can be seen at all, whilst moonlight, more especially if the moon be at the full, dims the stars to even the extent of rendering them invisible, but apparently it adds to the brilliancy of the planets

These are all astronomical facts, to the solution of which it would be futile to look to astronomy, but if the belt in which the planets revolve around the Sun be in a higher electrical state than other parts of space, such a condition might considerably influence the reflected light from the planets, and

we are told that Mercury is white, corresponding to the "white heat" of the smith's forge, that Venus is the most brilliant or dazzling, twinkling persistently, and such being the case she should make her appearance before Mars or Jupiter after sun-down, whilst the fact that reflected moonlight renders the transmitted light from the stars dim and even invisible should make us cautious how we accept the rate of travelling of the light from one of Jupiter's satellites, data for the speed of that from the fixed stars, even were all other conditions the same

Light, like Creation, as already stated, may be, and probably is, one of those facts to the cause of which man will ever be a stranger—at all events in so far as regards the manner of acting of that cause Yet we are unconditionally assured by the astronomer, in reference to like mysteries, "that the "force of gravity at the Sun's surface is 27 9, not 28, the force "of gravity at the Earth's surface" "That by this force all "the planets would fall into him were it not counterbalanced "by his centrifugal" Then we are told of the poles of the ecliptic that "the north pole of the heavens moves so as to "describe a circle round the pole of the ecliptic in 25,868 "years," by which time possibly Earth will have completed the greater part of her "spiral" of approach to the Sun, the motion, in all probability, that has led to these gigantic calculations

In reference to this last great astronomical fact, it is said by the author of "More Worlds Than One" that "by com-"paring the places of eighty fixed stars as determined by "Roemer in 1706, with their places as observed by Lacelle in "1750, and by himself in 1756, he found that the greater "number of them had a proper motion—that is, a motion that "could not be explained by any cause connected with the "motion of our Earth in its orbit or upon its axis In order "to explain this motion, he suggested that it might arise from "a progressive motion of the Sun to one quarter of the heavens, "in consequence of which the stars, to which he was approach-"ing, would appear to recede from each other, while those in "the opposite region, from which he was moving, would ap-"pear to approach one another" So that the planets would not only revolve in a circular orbit around the Sun, but, as he

travelled, they would also be carried along by him at the enormous speed of 2,000,000 miles daily Hence the actual paths which they would describe in the heavens would consist of those two motions, and would possibly be a spiral, as stated by Sir J Herschel in 1866

But though the planets would not then travel over the same orbit a second time, but would move through a different part of space at every annual revolution, it would not prevent each orbit impressing its own characteristics and influences on the planet which happened to be within that orbit The Sun's electrical atmosphere would accompany him, and the vital factor in each orbit is the amount of electricity it contains, which amount depends on its distance from the Sun

Whether the Solar System does or does not revolve around some larger but as yet unseen orb in no way affects our ideas of the approach of the planets to the Sun, but as Earth's orbit is a factor in this revolution of Suns we have been induced to make reference to the subject

Another idea which occurs to us is that the Sun, in his rapid journey, is passing into a more electrical part of space, which may explain why Earth's atmosphere is much more electrical than it was in previous centuries, rendering possible the use of electricity for heating, lighting, cooking, traffic on land and sea and in the air, wireless telegraphy, &c , &c

The present mean distance of Earth from the Sun is stated to be about 92,890,000 miles

On one point, however, there can be no difference of opinion, that great as may be the light we derive from the Sun through our atmosphere, the ' rays " producing it must be as nothing to those on the surface of the Sun, where obviously they would not be in any way refracted But our Moon is a body 2,000 miles in diameter, and although at the distance from us of 240,000 miles, by her " silvery light " when at the full, even in these latitudes, ordinary type can readily be made out under certain conditions of the atmosphere

The Moon being a round body naturally sends back the Sun's rays at various angles to those of the Sun's outer circumference, which outer circumference must be in *every respect identical to the other parts of his surface*, through which Herschel saw the inner layer he improperly termed the Sun's

atmosphere May not, then, these flashes of light be referable to the reflected rays from the Moon mingling, as it were, with those from the Sun The reflected rays from the Moon must obviously go somewhere and should count for something, and if in this conclusion we should be right, this corona must be of comparatively recent date, and as we approach the Sun should increase in brightness if not decrease in width

EARTH IN HER PRESENT ORBIT.

CHAPTER XIII

Physical questions—Earthquakes and storms—The *coup-de vent*—Cross-seas—Oxygen and nitrogen—Nitric acid—The combustion of coal and its effects—The Electrical Balance, illustrated and described—Sap rises in March—Falls of round snow, balls and lumps of snow—Insects, how produced

THERE are few subjects that have been more speculated on than earthquakes, and the theories have been almost as various and numerous as the speculators, but in our present total ignorance of the relative electrical condition of the earth and of the atmosphere all that can be said in reference to them is that in tropical or temperate regions they are always preceded by a highly oppressive negative atmosphere, when the earth must be correspondingly positive—*i e*, electrical, that they are accompanied by a noise resembling that of thunder following a flash of lightning, and the flash at the cannon's mouth, they are most common within the Tropics, where, we suspect, the earth is relatively constantly positive to the atmosphere, whilst, if history is to be trusted, the first of later earthquakes was in 1612, and they began to decline in 1800 When was the zodiacal light first noticed? And was there ever *an earthquake* in a Tertiary formation, more especially in that of the Post Pliocene, which interposes such a mass of comparatively light matter to the influence of the sky?

Connected with earthquakes are hurricanes and storms, all which we conceive are produced by the same cause, modified by circumstances

We have long been of opinion that waves are not the result of the wind, but that both originally proceed from the same cause, and in reference to the earthquake at St Thomas on November 18, 1867, it is said that 'about eight or ten "minutes after the heavy shock an immense sea wave or roller

"(about 30 feet high) was observed rushing in from the south "directly towards the ship Providentially, before the roller "reached the bay, *the water in shore* receded, causing the ship 'to swing, so that she presented her quarter to the wave" This wave was produced during a dead calm, and the receding waters in shore clearly show that it was caused by a lifting influence elsewhere

These "rollers" apparently always attend earthquakes, and are proportional to them

It is known that oil thrown overboard during a storm will quiet the waters around a ship and prevent her foundering, also that "atmospheric pressure" always decreases before a storm, whilst there are such things as waterspouts of water drawn up by clouds.

Heavy rain, which is very electrical, also materially keeps down high waves

It is said that the "*coup-de-vent*" at Mauritius is invariably preceded by a small cloud in the offing, to which other clouds fly from all directions, and we need scarcely remark that during stormy weather showers are invariably preceded by and accompanied with violent gusts of wind Formerly, with plenty of sea room, there was no difficulty in riding out a gale by putting the ship to the wind, not so now, cross-seas prevail, instead of the round waves with which seamen were familiar till the middle of the 19th century Old sea captains have affirmed that cross-seas were first noticed about 1845

Air is composed of *four* nitrogen to one oxygen, but nitrogen, to form nitric acid, combines with oxygen in the proportion of *one* to five The acidifying action of carbon in the soil affords, then, a ready means for disposing of the free oxygen that must through vegetable influence attend the increasing combustion of coal, and if by causing an increase in nitrogenous matter it prevents an increase in *decay* or should produce a decrease, we can readily comprehend that increase in combustion need not cause a corresponding increase in the amount of rain, but that it must inevitably cause a decrease in the atmosphere, since the amount of carburetted hydrogen of both natural ("burning") springs and of decay must be on the decrease and will not keep pace with the increasing quantity of nitrogen evolved, which nitrogen must

remain in the surrounding regions, or fly to distant orbits, to be again formed into air—a conclusion that equally applies to the gasiform vapour of evaporation

This conclusion respecting nitrogen we formed many years ago, but while repeating it, in a paper we were then writing for publication, our eye caught the flicker of flame over the fire, and in that flicker saw the escape of a large quantity of carburetted hydrogen Here, then, was a great source of supply, and by repeated experiments we became convinced that the gas evolved from burning coal combines with oxygen of the air only at a certain temperature, below which temperature, as on lighting a fire, or putting fresh coals on it, even when in vivid combustion, nearly all the light gas escapes unconsumed This gas, then, is not *wasted*, as it is said by science, but, on the contrary, its escape may materially prolong the existence of the animal kingdom by preventing the more rapid decrease of the atmosphere, and the fog of large towns, attributed to the generation of smoke, is nothing more than a penalty for our setting at defiance the laws of health by substituting a wilderness of brick and mortar for surroundings of vegetation, the regenerator of the atmosphere

Before the 19th century little use was made of coal, and Cavendish, in 1781, could not more than detect nitric acid in the rain of even thunderstorms, but since 1851 it has been collected in large quantities, so large, in fact, that an annual fall of 68 lbs per acre was estimated in 1863, but this, we think, for that period must have been in excess

The oxygen of our atmosphere is being, then, progressively converted into nitric acid, which acid, being highly soluble, must combine with some bases as salt These salts may be, and no doubt are, decomposed to the production of *nitrogenous food*, but the addition of carbon to the soil is constantly on the increase, thereby increasing the acidifying principle, and about 1848 another decomposing influence became apparent, ozone, an electrical state of oxygen much akin to the vapour of nitric acid, as we demonstrated to a meteorologist by putting the test paper over the mouth of a bottle of that acid

There are certain facts that irresistibly force themselves on our notice, and one of these is the generation of carbonic acid by combustion, of which gas there is formed from coal alone

on the atomic theory no less a quantity than 740 million tons to every 200 million tons of coal consumed

By a return from the Home Office it appears that the annual United Kingdom's output of coal in 1859 was 62 million tons, and in 1913 was 287,411,869 tons In connexion with this enormous output and consumption of coal there is annually exported from the Tropics thousands of tons of carbon in the form of sugar, rice, cotton, tobacco, spices, &c., without apparently decreasing the quantity of carbon in those regions Where, then, goes the carbonic gas, and whence is obtained the carbon which keeps up the supply for the growth of the tropical products?

Science easily disposes of the difficulty so far as regards the gas by "diffusion," but allowing the existence of a law antagonistic to gravitation there assuredly should be a greater amount of diffusion in the neighbourhood of our centres of production than at the Poles, but such is not the case May not, then, the carbonic acid of vivid combustion have a sufficiently ascending influence to reach the higher regions, and, by centrifugal, be carried to the Tropics, where it returns to the earth in combination with rain, or, possibly, by its own specific gravity in combination with dew? It is, at all events, a question easy of solution, and the air over the ocean, it is said, contains more carbonic acid than does that over the earth

The next fact is the amazing development of the human mind within the last hundred years in the *wheat-feeding* portions of the human race

Why geology, chemistry, and a host of other distinguishing features of the present age, but more especially electricity, were not dreamed of before the combustion of coal and consequent generation of sulphurous and nitric acid we must leave for others to speculate on, but that the human mind has developed in a ratio not much at variance with the combustion of coal is, we think, beyond all question, it being at least conclusively evident that the all-pervading mental blight of not more than a hundred years ago has decreased in proportion to that combustion, and till within a few years, in the absence of all other evidence, we have assigned to the same influence the blight in the vegetable kingdom which has increased with the decrease of the mental blight

Whether that may or may not be the case, it seems certain that a complete revolution is taking place in our atmosphere and earth as shown by the results of our Electrical Balance, which we invented in 1845 and which we registered till 1880

There is no evidence of the *relative* electrical state of the earth and air before 1845 The prevailing opinion then was that the earth was the grand emporium of electricity, and as we differed from this idea we determined to put the question to the test of experiment It occurred to us that as *evaporation was solely an electrical phenomenon*, we should arrive at the truth by putting the same amount of water into each of two vessels suspended from a beam, the one being in connexion with the earth and the other insulated from it By carefully weighing the vessels each day at 9 a m and 10 p m we should find out whether the earth or the air possessed the most electricity by the amount of evaporation which had taken place in the insulated or in the non-insulated vessel

The sketch (Fig 13) on the next page illustrates this apparatus in a safe which had stout gauze sides and doors

We give the returns of two years only, 1846 and 1849 —

	D a—Insulated	*D b*—Non insulated
In 1846	3,360 grains	1,983 grains
In 1849	1,720 grains	3,915 grains

showing that in 1846 there was a great excess of evaporation from *D a*, proving that there was much more electricity in the air in that year than in the earth

In 1849 the excess of evaporation was clearly from the ground, showing there was more electricity there than in the air In 1846 the potato disease prevailed, and in 1849 the cholera. This apparatus was in use in 1880, but during the ten years previous to that date all excess of evaporation was from the insulated vessel, and that to a large amount, with the exception of one year

If such an apparatus were set up in all our Colonies as well as in every town in England it might lead to many discoveries being made as to the causes of diseases, &c, in both the vegetable and animal kingdoms

The safe was in a sheltered place protected from the wind and sun.

In connexion with our Electrical Balance an interesting

question occurs to us—*i e*, Why is Earth's North Pole magnetic?

Whether an electric current be made to revolve round a bar of iron, or the bar revolves in an electric atmosphere, the effect is the same—the bar is thrown into the magnetic state, as we have already remarked

Earth is hottest at the centre, and, therefore, that part must

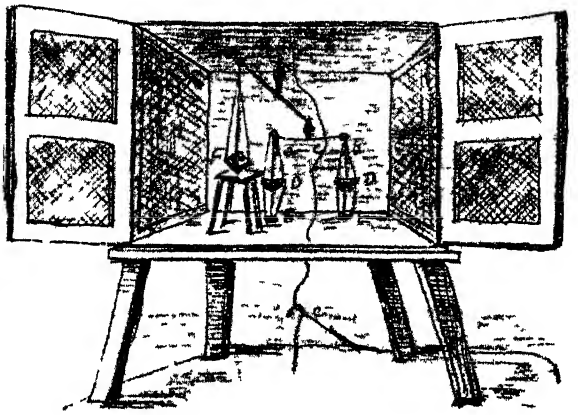


FIG 13

Electrical Balance

a—Silken threads suspending and insulating vessel *D a*

b—Fine copper wire suspending vessel *D b*

c—Stout copper wire connecting *b* with the earth

D—Two copper vessels 7½ inches in diameter, holding a quart of water each

E—Small weight dishes for the restoration of balance from difference of evaporation in insulated (*a*) vessel and non-insulated (*b*) vessel

F—Weights representing the total evaporation of water from both vessels

be in the extreme negative condition, and we know the atmosphere is cold or electric in proportion to distance from Earth Our Electrical Balance indicated pretty clearly that that part

of the atmosphere in which we move is now (1880) sometimes positive and sometimes negative as compared to the Earth

This part of the atmosphere may then be considered the central or neutral point of electrical condition As Earth revolves in a highly electric medium in her orbit, she must necessarily *have one of her poles thrown into the magnetic state*

So did we reason in 1847, and to the present time (1880) have seen no evidence suggestive of error But are we justified in comparing a planet, which is supposed to have a highly-heated interior with an outer crust, to a bar of iron, which, on being surrounded by an electric atmosphere, has both ends or poles powerfully influenced? whilst to the best of our knowledge Earth's south pole is not in any way magnetic As, however, a bar of iron suspended horizontally in the atmosphere becomes a magnet, there can be no reason why the supposed magnetic influence on the needles should not be referable solely to the electricity of the atmosphere and not proceed from the earth

About the period of the fall of the leaf in these latitudes reptiles retire into holes or bury themselves in mud and remain dormant until the spring, when they emerge

Also, when the northern hemisphere is turning towards the Sun, in March, the sap rises, but in September, when the days are of the same length, it ceases to rise, but why we know not The fact that the northern hemisphere then turns from the Sun is no solution to the difficulty so far as we know at present There is, however, a fact that has some bearing on the question

If a joint of meat on a spit turned by a jack turn towards the fire, it will cook at a rate proportional to the "radiation," the browning of the meat, as we have already observed, being evidence, by the conversion of the oxygen and hydrogen into vapour, of a high electrical state, but no such effect takes place if the joint is turned *from* the fire, although at the same distance from it There does not appear to be any difference if the joint dangle in front of the fire, whether it turn from the left to the right, or from the right to the left—that is, from East to West, or West to East

At 2 p m on May 22, 1867, there fell with rain at Fawley, near Southampton, round snow, which descended in nearly a perpendicular direction and apparently as fast as the drops of

rain, and in the winter of 1879-80 there were several falls of round snow but without rain In January 1881 there was also some round snow

At the period of the creation of the butterfly, silkworm, &c, as we have premised, the earth was positive and the air negative—conditions the opposite to those that now prevail in temperate latitudes In the early days of May 1869 the sky was obscured by a thick fog, commonly known as blight, and towards the middle of the month we observed on our apple trees webs full of very small caterpillars, which continued to increase in size until they attained the length of about half-an-inch, when on the web bursting they dispersed over the trees The question, then, naturally arises, as these insects are seen only at periods of great blight, what is the cause of their production, and on what do they increase in size if not in numbers while enclosed in the webs? Some of the tops of the branches of our turnip seed plants were likewise covered with insects, which apparently remained in clusters and did not disperse in search of food, and unquestionably did not feed on the plant

In 1857, at St Brieux, in Côtes du Nord, Brittany, a thorn hedge about a quarter of a mile long was stripped of every leaf, and when all the leaves were gone the small black caterpillars crossing the road actually concealed it from view Turnips likewise are "eaten up by the fly," and the potato disease of 1845-6 was attended with its aphis vestator, for all which insects we can trace no other origin than "blight" They come, and go, we know not how or where That both Crosse and Weekes produced insects through the agency of electricity—the principle of life—is unquestionable, it being also a well-established fact that pigs, reared in starvation, when supplied with a generous diet, after a while become covered with lice, which also unaccountably disappear after a time

To the last highly-interesting fact we were a stranger until our removal to France, although we had kept pigs before going there Having bought a long-legged pig that was little else than skin and bone, in a short time he acquired flesh—in fact, did credit to our keeping, and one morning, seeing that he was covered with lice, or insects very much akin to lice, we made arrangements for an ablution with hot water and soap, but having directed the attention of a Breton woman to them, we were told that it was of no consequence whatever, it being

only his low condition that was coming out, "Ce n'est que la misère qui lui soit," and that they would soon disappear, and notwithstanding our watching they most unaccountably disappeared Whether these insects were first produced in some concealed part of the body, as under the legs we are unable to say, but on the first sight of them they were full-grown and most active

We also kept fowls, and there not being accommodation in the fowl-house for the setting hens, at about 2 feet from the garden fence fronting the S W, a wall was run up of bricks and mortar with division walls for nests, but the mortar having been expended, to complete the number desired, two were made of loose bricks—that is, without mortar—the whole being covered with a sheet of zinc as a roof This arrangement answered admirably for the spring, but as the Sun gained power and the fowl dirt increased, some very small red insects were detected, and as they increased in number, although regularly destroyed, the source of supply was sought for, and on placing pieces of cambric between the roof and the bricks the pieces on the loose bricks became actually covered with the vermin, the joints between the bricks being full of them We have no doubt but that under similar conditions they may be reproduced, although it may be necessary now to go further south to obtain satisfactory results At the period (1863) humble-bees were still very numerous, but now (1915) they are verging on extinction

It may be remarked that the destruction of the hawthorn hedge by caterpillars at St Brieux is a fact we have never noticed either before or since, and all blights are periodical Whence the aphis vestator of the potato, and why it disappeared, no one can tell

EARTH IN HER PRESENT ORBIT.

CHAPTER XIV

Character of the Permian formation explained by Kepler's "series of numbers"—Tables of planets, 1852 and 1911, and remarks thereon—Changes in our climate and in the electrical state of the soil and air in northern latitudes affect reptiles, insects, and agriculture—Combustion of coal—Explanation of November shooting stars—The increase of overcast—Mankind a motive power in the Solar System—Summary of the purpose of the several orbits—Disappearance of mankind and all life from Earth—The purpose of it all?—Electricity God's all-pervading agent in the evolution and decay of planets

We are again induced to revert to the Permian formation, of which it is said "This formation, including its underlying "red conglomerates, sandstones, and marls, is important as "immediately overlying the Carboniferous"

We are told also by the geologist of there having been a disturbance in the coal-bed formation, and by astronomy of a change of inclination to the Sun, the planet in Saturn's orbit revolving at an angle of 26°, whilst Jupiter has an inclination of 3° only

As in the Permian, which took place in Saturn's orbit, there are conglomerates and a kind of admixture of the materials of the coal-bed period and of the next following formation, we are induced to draw attention to an astronomical fact that has presented itself and which seems to suggest a reason for the mixed character of the Permian formation we mean the series of numbers representing what are termed the fixed orbits That is, if half the distance of each planet from the Sun be placed on each side of the respective orbits, the *first* half of the following orbit extends far into the *second* half of the orbit preceding it

These numbers do not appear to have been utilised, and we do not profess to understand on what facts or principles they are based, but they are the discovery of the illustrious Kepler, as stated in "Vestiges," &c

The numbers are multiples of the figures appertaining to the *second* planet Venus, thus —

0, 3, 6, 12, 24, 48, 96, 192, 384,

to which 4 is added —

4, 7, 10, 16, 28, 52, 100, 196, 388

By way of putting them to the test of inquiry we sought for a number by which they might all be multiplied, and as 9 was quite within reasonable bounds of agreement with the measured distances given in a table of the time by Herschel, and gave the exact number for Mars, we had no hesitation in adopting it The distances then in millions of miles will stand thus —

Mercury	Venus	Earth	Mars	Asteroids	Jupiter
36	63	90	144	252	468

Saturn	Uranus	Neptune
900	1,764	3,492

In the above figures we have what may be considered to represent the supposed permanent orbits, or, mathematically, deduced distances of the several planets from the Sun, and as the measured distance of Earth is 92 millions of miles, or a difference of two millions, and there is a greater disparity for several of the distant orbits, it may be assumed that, to the present time, the cause of disagreement has remained uninterpreted If, then, we equally divide these numbers and place one-half on each side of the orbit there will be —

Mercury	27 m m	Venus	27 mm	Earth	54 m m
18 18	„ „	31½-31½	„ „	45 45	„ „
		13½	„ „	17½	„ „
Mars	108 m m	Asteroids	216 m m	Jupiter	432 m m
72 72	„ „	126 126	„ „	234 234	„ „
27	„ „			108	„ „
Saturn	864 m m	Uranus	1,728 m m	Neptune	3,436 m m
450 450	„ „	882 882	882 „	1,746 1,746	„ „
216	„ „	432	„ „		

Comet or new planet

The figures between the planets show in millions of miles the spaces which separate them from each other, and these are obtained by subtracting the distances respectively from that following thus, the distance of Mercury from Venus is 27 millions of miles, and that of Venus from Earth is also 27 million miles, but the next space, that between Earth and Mars, is 54 millions of miles, or double, so that, omitting the Asteroid orbit, that for the next planet is 216 million miles, and, necessarily, between Neptune and the comet becoming a planet, or gathering round itself the dust and other materials of its "atmosphere," the space should be 3,436 millions of miles

The most important point of this inquiry undoubtedly is the periods of the planets' approach to the Sun, and as there are such enormous differences in the intervening spaces the rate of approach or measured distances must correspond to these differences

Astronomy divides the Solar System into minor and major planets—the minor being those between us and the Sun, the major those on the opposite side, or further removed than Earth from our luminary, a designation, we presume, which is referable to the size of the orbits, and which orbits, as already observed, have been considered as being fixed or permanent.

There being some difference of opinion amongst astronomers as to the possibility of determining our exact distance from the Sun, we cannot do better in the further consideration of this important question than confine ourselves to the line of numbers already referred to, and it is unquestionably a most singular fact that whilst in the forming orbits of the outer planets the *spaces* between them double with distance, in the de-grading orbits the spaces should be the same Between Venus and Earth the distance is 27 millions of miles, the same as that between Venus and Mercury, whilst between us and Mars the space is 54 millions, as if to allow room for the performance of certain operations Between Uranus and Neptune the space is no less than 1,728 m m, that between Uranus and Saturn being half that space—the distance of these three planets from the Sun being respectively Saturn, 887,098,000 miles, Uranus, 1,784,732,000 miles, and Neptune, 2,810,538,000 miles

The discovery of Uranus it is possible should be due to William Herschel's telescope, but Neptune announced his coming by what astronomy designates as perturbation What-

ever may be the intended interpretation of that word, the perturbation of Uranus must have been referable to a push onwards by Neptune, whose approach to the Sun must be twice that of the approach of Uranus, otherwise the relative distances of the planets from the Sun could not be maintained, and the measured distance is said not to accord with that of the Bude Law

Assuming that the planets approach the Sun to ultimate destruction, it is evident that as one planet disappears another will enter on the stage, and it must be equally conclusive that when the planet in this orbit begins to decay another will commence forming

In the two tables on the opposite page the planets' measurements, as given in 1852 and in 1911, are compared

It will be noticed that there are very many great differences in the measurements of the planets in these two tables, and if we accepted these figures as correct it would seem that all the planets had approached nearer to the Sun and had also decreased in diameter, whilst Mars' angle of inclination has decreased

But present-day astronomers assert that all these differences are due not to any change in the planets' size or orbits, but that they are referable to the fact that it was not till recent years that astronomers were able to get more accurate measurements by observations on transits of Venus, the new Asteroid Eros, and by other means with the aid of more accurate instruments than the crude and unreliable ones the astronomers of a century or so ago possessed

But though the planets may have revolved for thousands of years in their present orbits, it does not follow that they will always remain in those orbits A few thousands of years are nothing in the life of a planet whose periods are reckoned by millions of years, and we feel sure that in accordance with the universal law of change, the planets will approach the Sun, and in due time each one will undergo decomposition, and finally combustion in or near the Sun.

The idea of the creation of the planets in the outermost orbits of our Solar System, where alone the tremendous heat exists which is necessary to fuse their rocks, is the only theory which has been advanced to explain why and how those rocks were formed Geologists assert that they were formed under

TABLE OF PLANETS, 1852

	Distance from the Sun	Diameter	Year	Angle of Inclination	Rotation	Sun's Diameter as seen from Planets	Moons
Mercury	37,000,000 mls	3,200 mls.	88 days	—	24 h. 6 m	80′	—
Venus	68,000,000 ,,	7,800 ,,	224 ,, 17 hrs	—	23 h 20 m	46′	1
Earth	95,000,000 ,,	7,930 ,,	365¼ ,,	23° 28′	23 h 56 m	32′	1
Mars	145,000,000 ,,	4,200 ,,	686 ,,	29° 30′	24 h. 40 m	13′	2
Asteroids	225 263,000,000 ,,	276-2,099 ,,	1,335 ,, to 1,681	—	—	12 & 11′	—
Jupiter	495,000,000 ,,	89,000 ,,	11 years 315 days	3° 5′	9 h. 56 m	6′	4
Saturn	906,000,000 ,,	79,000 ,,	29½ ,,	—	10 h. 16 m.	3′	8
Uranus	1,820,000,000 ,,	35,000 ,,	84 ,,	—	—	1′	8
Neptune	2,875,000,000 ,,	37,500 ,,	165 ,,	—	—	—	1 or 2

TABLE OF PLANETS, 1911

	Distance from Sun	Diameter	Yearly Revolution.	Angle of Inclination	Rotation	Moons
Mercury	36,000,000 miles	2,976	87 days 96 hrs	—	87 days 96 hrs	None
Venus	67,269,000 ,,	7,629	224 days 70 hrs	—	224 days 70 hrs	None
Earth	92,998,000 ,,	7 917	365¼ days	23° 27′	24 hrs	1
Mars	140,701,000 ,,	4,200	680 days 97 hrs	23° 13′	24 hrs 37 mins.	2
Asteroids of which there are 800		—	—	—	—	—
Jupiter	438,853,000 miles	86,259	4,332 days 58 hrs.	3° 0′	9 hrs 55 mins.	8
Saturn	887,098,000 ,,	72,772	30 years	27° 0′	10 hrs 16 mins	10
Uranus	1,782,732 ,,	32,879	84 ,,	98° 0′	10 hrs 0 mins.	8
Neptune	2,796,528 ,,	29,827	165 ,,	145° 0′	—	—

tremendous heat, but no one else has so far explained where the heat came from

This theory, too, explains why the interior of Earth is still so very hot, and also why the evolution of life was progressive from the lowest forms to the highest Why? Because as Earth advanced nearer to the Sun she entered more electrical orbits, and we have shown that life is due to electricity, consequently, the types of life evolved rose in proportion to the increased supply of electricity But though Earth may not have advanced nearer to the Sun during the last 100 years, it is evident that a great change has taken place in her climate

As we have said, the several orbits have conditions suited to the purposes they have to fulfil, but when Earth emerged from the glacial orbit the air temperature at the then distance from the Sun was probably very considerably higher than it is now, and within very recent times the variation has been towards an augmentation of cold, as shown by the inquiries of M Venety on the variation of temperature of the Swiss Alps, but if compared with still more ancient epochs the evidence is in favour of a rise of temperature

M Venety established the first of these positions by a reference to both historical monuments and documents, which prove that some of the Alpine passes, now scarcely practicable, were then the ordinary lines of communication Also, in the archives of the communes le Bognes, M Rivaz found a record of a "legal process between the commune and the commune of "Liddes, relative to the possession of a forest then on the "territory of Bognes, which has since disappeared and been "replaced by a glacier, now entirely cutting off the communi-"cation"

The same conditions that produce an increase of cold should also now produce an increase of "pressure in the atmosphere," although the atmosphere may be on the decrease What, then, is the average of the barometer for the last ten years compared with a similar period of about 1800 and what the difference in the vibration of the pendulum at the North and at the Equator?

We should not omit noticing also that whilst the point of perpetual frost in the air is getting lower, and the warm nights and warm rains are departing 'the mean annual temperature

"at Greenwich continues to increase in precisely the same ratio "as before"—that is, the mean annual temperature of —

The	29	years	ending	1799	was 47 7°
„	30	„	„	1829	„ 48 4°
„	30	„	„	1859	„ 49°
„	46	„	„	1905	„ 49 5°

In 1909 the mean annual temperature was 50°

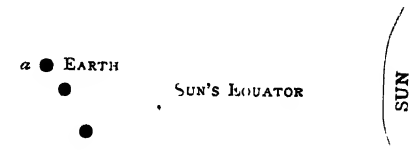
The mean temperature of the year 1914 was 50 8°, or 1 3° above the average of the seventy years 1841-1910, as stated by the Astronomer Royal in his Meteorological observations ("Daily Graphic," June 7, 1915)

When the question shall be tested by our Electrical Balance it will be found that the soil has lost that electrical and evaporating influence which it possessed in 1845, and that is the cause, no doubt, of the great falling off in the produce of the land within the last seventy years in these latitudes It is possible, then, that at the period referred to the excess of evaporation was in the soil, and that the freezing of the "hard winters" of those days should have been still in the soil as it must have been in the glacial epoch, and, if so, although Earth is entering a colder or more electrical medium, the glaciers may now be giving contrary evidence from the negative or warm state of the earth—a revolution, in fact, *that is exterminating the reptile class in many parts of England*, and sending the vine to the South, whilst apricots, too, are slowly but surely disappearing from Central Europe Our friend the humble bee, as already referred to, has almost disappeared, as well as many of the painted butterflies, and grasshoppers have not been seen for years The earth, in fact, is no longer sufficiently electrical to incubate the eggs During the last few years, also, a mysterious sickness has attacked our hives of bees

As regards reptiles, they are merely the link between the animal and vegetable kingdoms, but partaking more of the latter than of the former As we have already said, they do not breathe, and their respiration, which under water is not attended by the evolution of any gas, whatever it may be, is merely through the skin They are in a dormant state during the period of trees being without leaves, they mostly are produced from seed or spawn, and from the period of their

decay or passing away in the South of England and North of France, grapes and other soft fruits, &c, gradually deteriorated, and are fast following the reptiles, notwithstanding man's fostering, while ague and other diseases had almost disappeared by 1869

The Sun, having rotation, must be like Earth, an oblate spheroid, and where is the greatest amount of matter must be the highest electrical atmosphere, the bounds of which the planets, in their wanderings, never depass Allowing, then, the following dotted lines to represent those bounds and the line midway between them to be the Sun's equator, before the decrease in reptiles,



Earth may have been at the point *a*, and in 1866, the period of the November star shower at the next dot, and crossed the line in 1869, the period of the greatest decrease in reptiles, and as, in August 1870, the toad, the most hardy of the reptiles, not only left the ponds by millions on their transformation from tadpoles, but also swarmed of all sizes, it may be assumed that Earth's position then was somewhere about the position of the third dot

Between the period of the first use of coal and our increasing demand for its combustion—and in 1913 in the United Kingdom there were raised 287,430,473 tons of coal, also nearly 5,000,000 tons of iron ore and many other minerals—there ensued the gradual but increasing amount of overcast, the descent of the line of perpetual frost in our atmosphere, the generation of nitric acid and ozone, the appearance of epidemic diseases, both in the animal and vegetable kingdoms, the November shooting stars, the great changes now taking place in Saturn, Jupiter, and Mars, and the discovery of the increase in the number of the Asteroids

In this last fact there is at the least a most strange coincidence—*i e*, the increase in the number of those bodies to a certain period, as already stated, was progressive, then, by leaps and bounds, it kept pace with the combustion of coal on Earth, but whether this is simply a coincidence we must leave to the reader's judgment In reference to the November shooting stars, in our opinion these displays are nothing more than

the restoration of electrical equilibrium as the Earth journeys from one side of the ecliptic to the other and passes the plane of the ecliptic where the electrical atmosphere surrounding the Sun (space that is) is in the greatest intensity

The constantly increasing evolution of nitrogen (the result of combustion) with the presence in the upper regions of snow formation of the requisite quantity of "vapour" in the gasiform condition, must necessarily have an influence in producing a corresponding increase in what is understood as "overcast" —that is, the combining of the gases before crystallisation Unless we are under a misapprehension, at times after the thawing of snow up above, rain, instead of falling, re-evaporates and ascends leaving the carbon (cloud) and ammonia below, constituting the low overcast that is now of frequent occurrence for several days in succession without rain, and this overcast is much on the increase

Assuming, then, that a time will come when the quantity of nitrogen evolved will be in excess of the light hydro-carbon generated (whatever may now be the quantity of that gas at disposal), it will be used up, and from that period nitrogen and gasiform will be no longer restored to the earth

Looking at the Solar System we see a Sun in the centre, surrounded by eight planets in various stages of evolution In the outermost bounds are Neptune and Uranus, the periods of the formation of soil, minerals, vegetation, and early forms of life, Saturn and Jupiter, of coal, salt, and huge reptiles, the Asteroids, Mars, and Earth, the close of the Tertiaries, atmosphere and ocean formation, the creation of warm-blooded animals and the period of man, his creation and possibly his extermination—man, who in the supply of his natural and artificial wants has helped to destroy Earth's crust and become a motive power in the Solar System

By taking from the mountain, stone of different kinds for building, its exposure to the present increasing destructive influence of the air, causes its decay and ultimate formation of soil for the production of food, and the same results are produced with chalk, clay, and other materials, whilst flints and other stones are ground up on the roads and burnt for various purposes, not to mention the millions of tons of minerals annually extracted from the earth

And as if to ensure a more rapid decomposing influence, the

combustion of coal causes the generation of acids in the air, as we predicted in our papers of 1851 Mankind may rest assured that steam engines, railways, telegraphs, telephones, electric cars, aeroplanes, and all the other electrical wonders of the present time are not conferred on us free of cost, their coming must necessarily be attended with a decrease in the good things for our appetites proportional to the sharpening of our wits or what is understood by discoveries

We assume to ourselves unbounded credit for the enormous advance in science which has taken place in the last hundred years, but in our pride we become oblivious of the disagreeables that accompany our onward progress towards Earth's final extinction

Nearer the Sun than Earth come Venus and Mercury, where occur the close of the evaporating and roasting periods and other processes preparatory to the final conflagration of the planet

Venus's angle of inclination to the Sun, which alternately gives to her poles long perpetual day or night and intense heat and cold, must have a very great evaporating influence independently of that of orbit and of loss of atmosphere

The de-crystallisation and carbonisation of the soil—its conversion, in fact, into a kind of gunpowder—cannot fail in rendering it a worse conductor of the electrical influence of the surrounding regions and in making it negative At the appointed time, therefore, inside Mercury's orbit, when centrifugal shall overcome cohesion, all the crust of the planet will return to the Equator in a state of combustion

When, then, this globe shall have gone through the several processes for which it was compounded, and man shall have finished the work which he was created to perform, he will disappear from the face of the Earth, how and when it is as impossible to foretell as it is to forecast the manner of exit of those now living

When Earth enters the orbit of Venus she may alter her angle of inclination from $23\frac{1}{2}$ to that of Venus, which would cause a terrible rush of ocean water over the whole of the land and destroy all her warm-blooded inhabitants, or the decomposition of our air or other atmospheric changes might bring about their destruction

Many astronomers state that both Venus and Mercury ever

present the same hemisphere to the Sun and that Earth's tides will cause her also to lose her daily rotation If this should occur, mankind would find life impossible on either the dark or light hemisphere of our planet, and there must come a time when the crust of our Earth will be resolved into its several elements, as is now being done with that of the planet Mercury

Our Solar System is, then, a complete whole, the Sun, the centre and mainspring of it all, rushing along through space at 2,000,000 miles daily, carrying his family of planets with him—all, as it were, links in a chain, all having a great amount of connexion with each other, all passing through their allotted stages of formation, creation, decay, and extinction

We may well ask ourselves "What is it all for?" "Why "do the planets pass through all these wonderful processes?" But the answer to these questions is not for us in this life We do not know whether all the planets evolve the same forms of life, or whether each one, as it receives created beings, evolves a higher form of life But we feel convinced there is a Mighty Power controlling it all, that our Earth, though apparently in a state of chaos and disorder, is fulfilling her allotted task. Perhaps, when we in our turn pass beyond the veil, we may understand the why and wherefore, and have it all made clear to us!

Finally we assert, as we asserted in 1845, that electricity is the all-pervading agent and influence through which this mighty work has been brought into existence and by which it is now governed, or what is implied by "Nature" or "primordial" the dispenser physically of both good and evil—the sustainer of all life, the producer of food and of disease, in fact, the question we put in 1867 we still repeat, "What, then, is matter?" On metal being thrown into a furnace it passes with loss of cohesion from the solid to the liquid state, with a further increase of "temperature" from the liquid to the gaseous, assuming a higher electrical state still from the gaseous to ———?

And out of *nothing* God created the Universe.

THE END.